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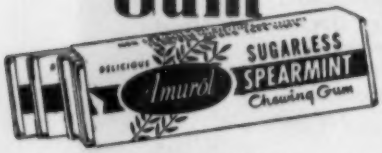

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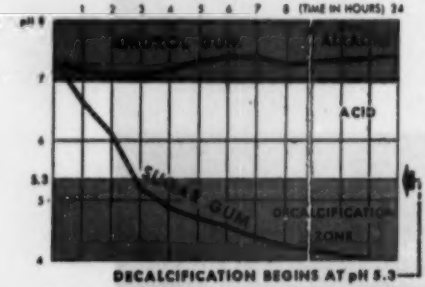

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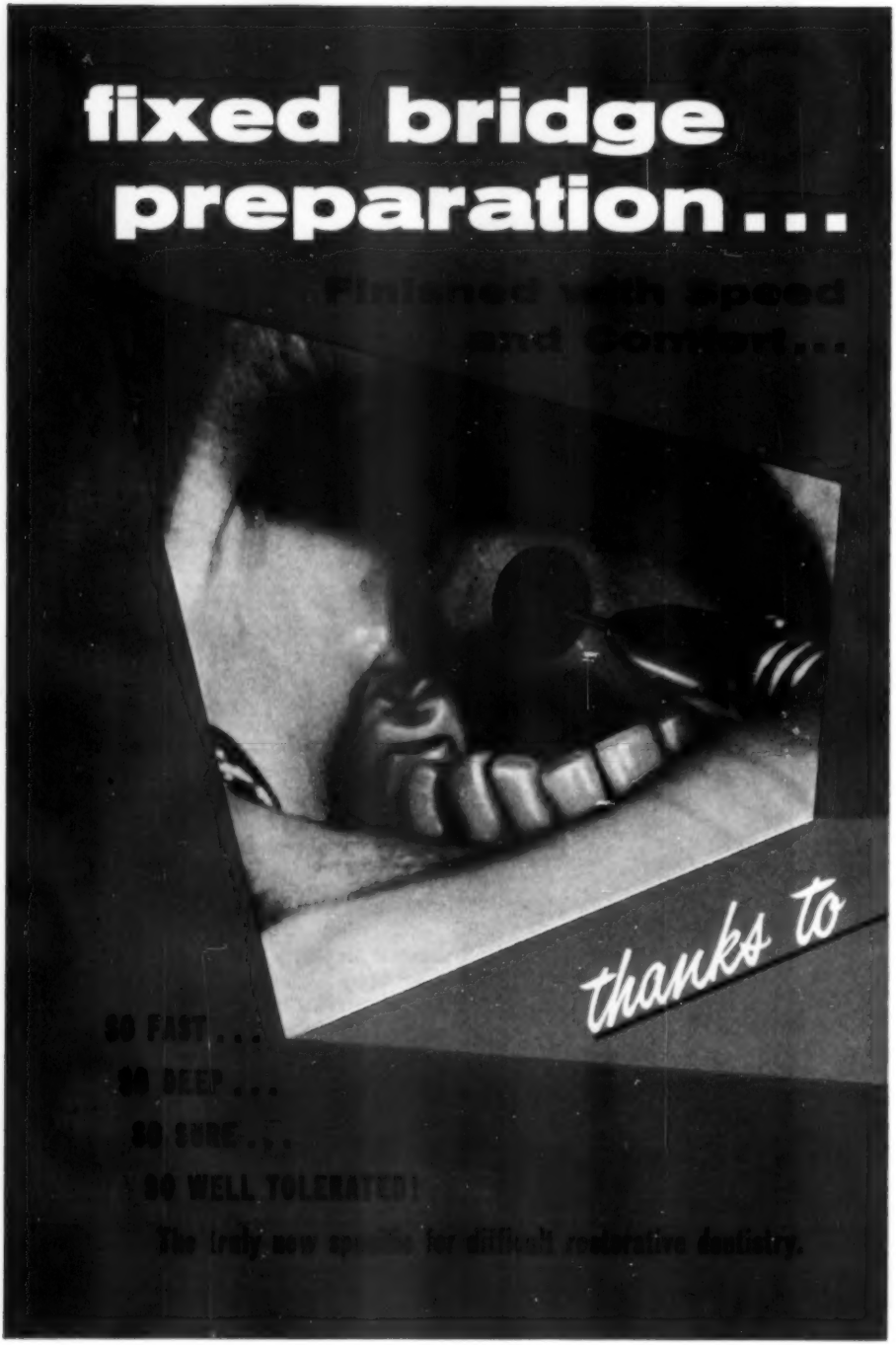
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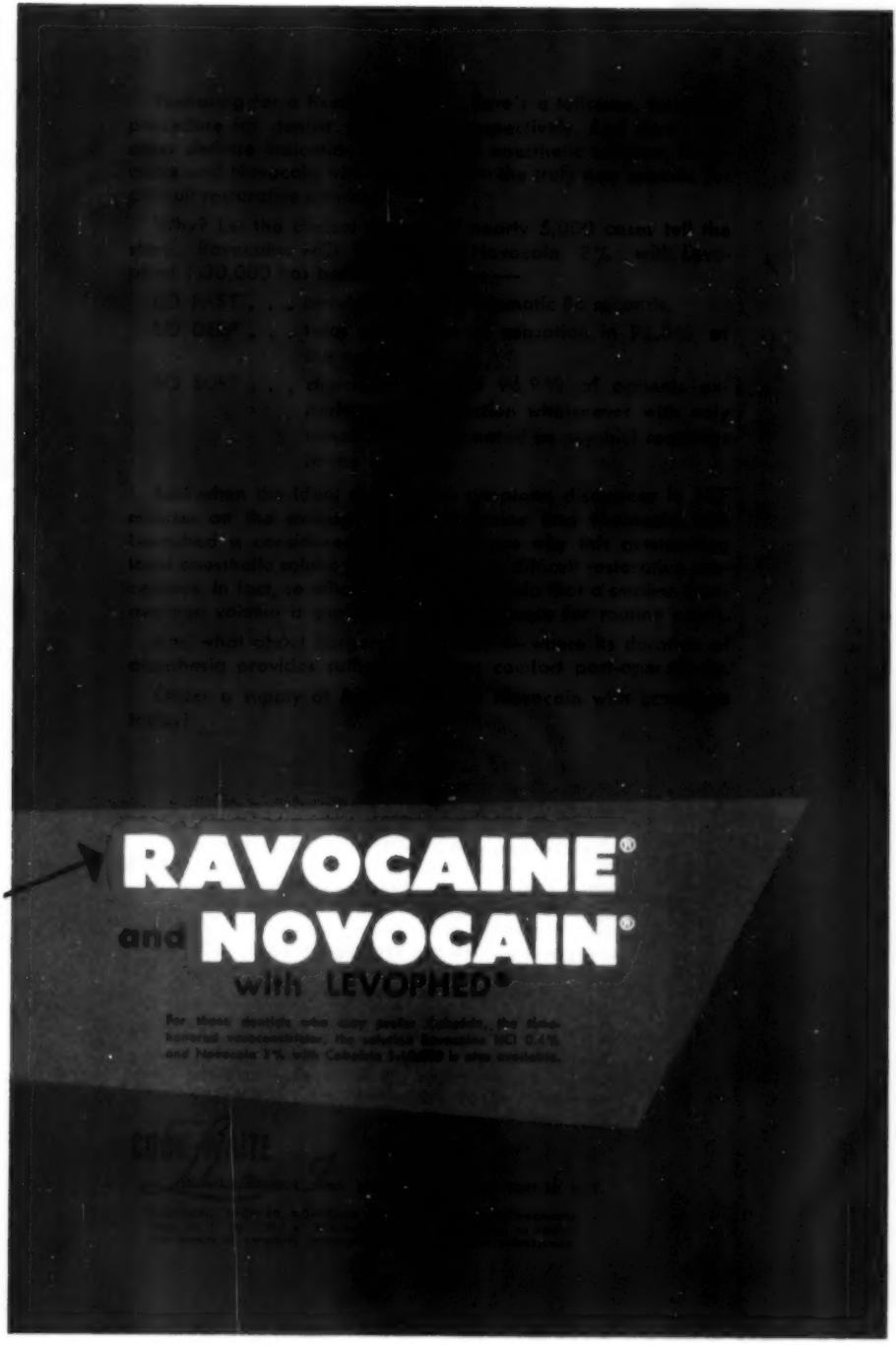
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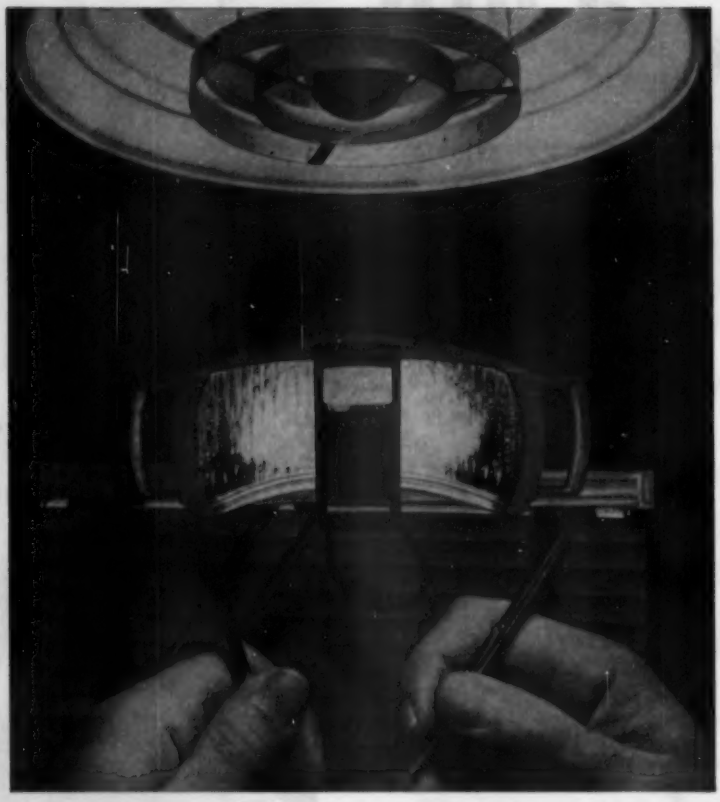

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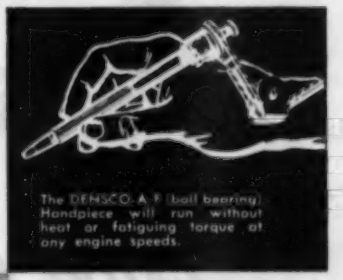

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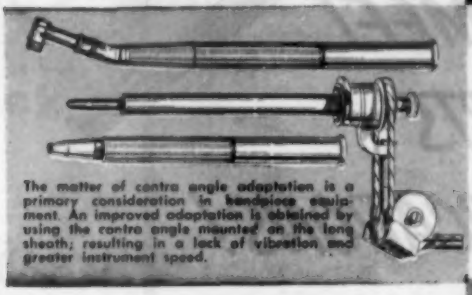

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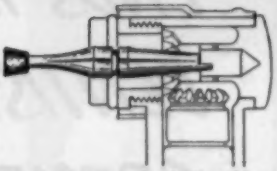

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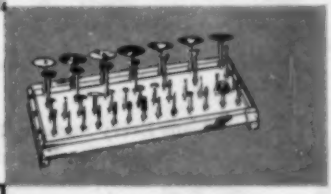

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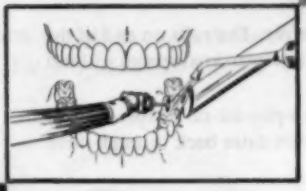

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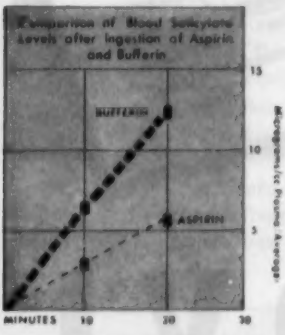

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Maintaining vitality of injured permanent anterior teeth

Harold Berk, D.D.S., Boston

Maintaining the vitality of permanent anterior teeth that have been injured by accident requires a basic understanding of pulpal reactions to trauma and of pulpal response to medication and treatment.

To help standardize the treatment of traumatized teeth, Ellis formulated a classification of traumatic injuries, listing nine classes based on location and type of injury. This paper is concerned with only two of these classes: "Class II, extensive fracture of the crown involving considerable dentin but not the dental pulp; and Class III, extensive fracture of the crown involving considerable dentin and exposing the dental pulp"[1] (Fig. 1).

The dentist faced with the problem of treating a fracture in either of these classes must answer the following questions: Should he base his decision as to the procedure he will follow on a clinical determination of the status of pulp tissue? How should the presence or degree of contamination affect his choice of treatment? Is there any method of predetermining whether or not a satisfactory response to treatment may be anticipated? If the prognosis is favorable, what materials and what technic will obtain for the patient the most satisfactory results?

This paper proposes some answers to these questions and offers a one-visit procedure for the management of Class II and Class III fractures. In the many cases treated in accordance with this technic during the past five years, a maximum of pulpal protection and healing with highly satisfactory esthetic results was obtained.

Presented before the Section on Pedodontics, ninety-fourth annual session, American Dental Association, Cleveland, September 30, 1953.

Assistant professor, department of oral pediatrics, Tufts College Dental School.

1. Ellis, R. G. The classification and treatment of injuries to the teeth of children, ed. 2. Chicago, Year Book Publishers, 1946, p. 22.

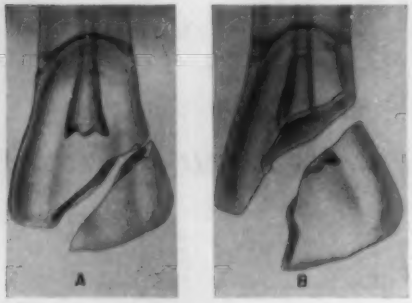

Fig. 1 • Fractures. A: Class II. B: Class III

DIAGNOSTIC FACTORS

Under normal conditions, the vitality of the dental pulp can be determined by the use of an electric pulp tester or by other suitable pulp-testing methods. After traumatic injuries, there is no way of determining accurately the status of the vitality of the pulp, the extent of pulp damage, or the presence or degree of contamination. In some instances, there may be a hyperresponse to the pulp test, in contrast to the response of the paired corresponding incisor; but after the inflammatory process subsides, the pulp may test normal when so contrasted. In other instances there may be no response, even though the pulp is vital. In fact, in some instances negative reaction to pulp testing has been noted for as long as nine months, and then after that period the pulp has tested normal. Furthermore, even with a positive response to the pulp tester, there is no clinical method, short of histological section, for determining accurately the extent of damage to the pulp.

Protective and restorative treatment should not be precluded on the basis of pulp testing alone. If arterial bleeding of the pulp is present or can be initiated, there is sufficient indication that the pulp is vital and therefore should respond to treatment. Unless there is positive clinical or roentgenographic evidence that the pulp is necrotic and that definite degenerative changes are in progress, protective and restorative treatment should be undertaken.

In Class II fractures, if the irritation resulting from traumatic injury is mild, hyperemia usually exists. Such hyperemia is initiated by thermal changes, such as hot and cold liquids or cold air, producing pain which on reaching a peak begins to subside almost immediately. The pulp, when irritated, protects itself by the formation of secondary dentin.[2] A mild irritation, such as would manifest itself by hyperemia, can stimulate odontoblastic activity and thus initiate the development of new dentin. Even in the absence of treatment, in some instances the pulp recovers; however, in most instances, the hyperemia, because of subsequent additional irritation, develops into a more serious inflammatory process, which results in degenerative changes of the pulp. Therefore, it is important that traumatized teeth be protected as soon as possible after the injury has occurred.

In instances in which the injury is still more severe, an inflammatory process which may produce degenerative pulpal changes develops almost immediately. This degenerative process may result in necrosis of the pulp; but in many instances, if the irritating stimuli are removed soon enough, a wall of fibroblasts will seal off the damaged tissue, and the rest of the pulp will remain healthy.[2]

In Class III fractures, since the pulp is involved, it can be assumed that contamination and possibly infection are present in the pulp. The bacteria or inflammatory factors may become walled off and controlled by fibroblastic and phagocytic activity, and the remaining portions of the pulp may remain healthy. Because of the activity of the microorganisms and because of possible subsequent

2. Boyle, P. E., editor. Kronfeld's Histopathology of the teeth and their surrounding structures, ed. 3. Philadelphia, Lea & Febiger, 1949, p. 71, 167, 154.

disturbances, however, the pulp may not be able to keep this region walled off indefinitely. Therefore, it is important that the contaminated tissue be removed and that immediate steps be taken to stimulate healing in the remaining pulp.

The only way that a pulp can heal completely is by the deposition of dentin in the injured region. Should an exposed region of pulp exist, this deposition must form a callus over this region.[2] The most effective stimulant for the development of this new dentin has been found to be calcium hydroxide.[3,4]

PULPAL REACTION TO CALCIUM HYDROXIDE

Reaction to Calcium Hydroxide as a Capping Material • In 1930, Hermann, reporting on the results of 15 years of research, showed that calcium hydroxide, when placed in contact with pulp tissue, stimulated the growth of new dentin.[5] Since that time, other investigators have demonstrated pulp healing by the formation of new dentin through the use of calcium hydroxide.[3-7] Hermann noted that in many instances the pulps had become completely calcified. He referred to this reaction as a physiological root canal filling.[6] Figure 2, left, shows such a case: a complete obliteration of the

3. Teuscher, George W., and Zander, Helmut A. A preliminary report on pulpotomy. Northwest Univ. Bul. 39:4 Dec. 5, 1938.

4. Glass, R. L., and Zander, H. A. Pulp healing. J. D. Res. 28:97 April 1949.

5. Hermann, Dentinobliteration der Wurzelkanäle nach Behandlung mit Calcium. Zahnärztl. Rundschau 21:887, 1930.

6. Eastlick, K. A. Management of pulp exposure in the mixed dentition. J.A.D.A. 30:179 Feb. 1943.

7. Zander, H. A., and Law, D. B. Pulp management in fractures of young permanent teeth. J.A.D.A. 29:737 May 1942.

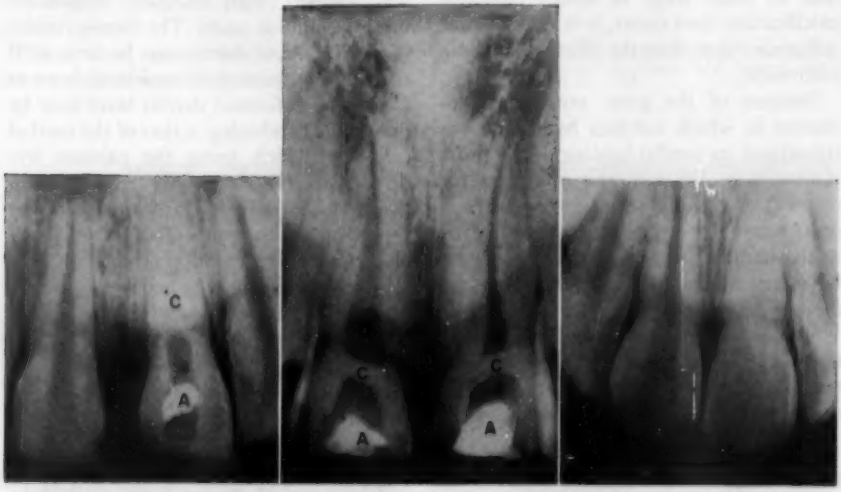

Fig. 2 • Left: Complete obliteration of root canal of maxillary left permanent central incisor after pulpotomy in which calcium hydroxide was used; A, zinc phosphate cement; B, calcium hydroxide; C, calcified root canal. Center: Variation in calcification after pulpotomies in which calcium hydroxide-methyl cellulose paste was used; A, zinc phospate cement; B, calcium hydroxide-methyl cellulose paste; C, new dentin bridge or callus; D, vital pulp tissue. Right: Complete calcification of pulp of maxillary left permanent central incisor resulting from traumatic displacement

root canal following a pulpotomy in which calcium hydroxide was used.

This case, however, is the only one in my experience in which complete calcification occurred. In all other cases which I have treated, a variety of patterns of calcification have been noted, from a dentin bridge to almost total obliteration of the pulp. Some of these variations are shown in Figure 2, center. The most common reaction has been pulp healing with the formation of a dentin bridge.

Figure 2, right, shows another tooth in which there apparently is complete obliteration of the pulp. In this case, however, the calcification is the result of a traumatic injury in which the tooth was displaced and realigned.

Inasmuch as complete calcification occurs in such a small percentage of the teeth treated with calcium hydroxide and since it can occur in the absence of any pulp therapy, the assumption can be made that in those teeth in which complete calcification does occur, it is due to some influence other than the effect of calcium hydroxide.

Because of the great number of instances in which calcium hydroxide has stimulated successful healing of the pulp, it should be the material of choice for capping the pulp and for use after a pulpotomy. The difficulties encountered in the handling of this powder, however, have precluded its universal employment.

When calcium hydroxide is applied to the pulp, whether as a dry powder or mixed with water, some technical difficulties may be encountered, such as:

1. The calcium hydroxide applied in this manner does not adhere readily to the dental tissue.
2. If bleeding or seepage of the pulp occurs, the calcium hydroxide may be dislodged.
3. The calcium hydroxide may interfere with the proper adherence of the cement base. As a result, an intermediary liner may be required.
4. The pressure used in placing an intermediary liner or cement base may force calcium hydroxide into the pulp and thereby produce undesirable irritation.
5. Dislodgment of the cement base is common if the calcium hydroxide has adhered to the lateral walls of the cavity.

It is desirable, therefore, to use a vehicle for calcium hydroxide which will overcome the difficulties encountered without impairing the drug's beneficial qualities. Of the known vehicles, an aqueous solution of methyl cellulose is most ideal, because it creates a tenacious paste that is easy to handle, that is cohesive and adhesive, and that forms a film. An intermediary liner is not required prior to inserting the cement base.[8]

Figure 3 shows a histologic section of a human tooth ten weeks after the pulp was capped with calcium hydroxide-methyl cellulose paste. The dense, newly-formed layer of dentin can be seen at B and the well-formed odontoblastic layer at C. This well-formed dentin layer may be due to the combining action of the methyl cellulose, which keeps the calcium hydroxide in contact with the exposed pulp tissue but prevents it from penetrating the stroma of the pulp. This action probably permits the creation of that mild irritation which is most ideal for stimulating the formation of new dentin. Hence the methyl cellulose seems to enhance the beneficial effects of the calcium hydroxide.

Reaction to Calcium Hydroxide as a Dentin Lining Material • Recent research and histological studies have resulted in a better understanding of pulpal reaction to dental materials.

8. Berk, Harold. The effect of calcium hydroxide-methyl cellulose paste on the dental pulp. J. Den. Children 17:65 Fourth quarter 1950.

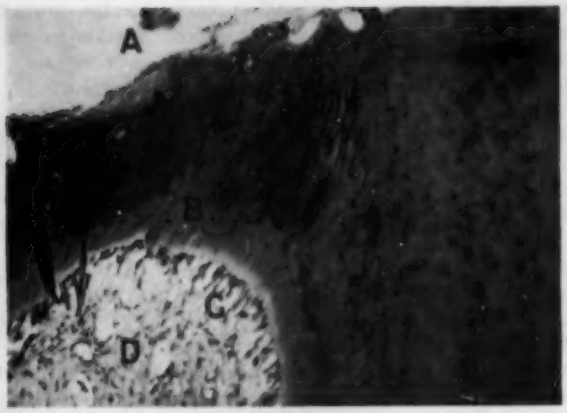

Fig. 3 • Histologic section of human tooth ten weeks after capping with calcium hydroxide-methyl cellulose paste; A, site of exposure; B, new dentin or callus; C, continuous odontoblastic layer; D, vital pulp tissue

It is well established that procedures involving the dentin may produce adverse effects on the dental pulp. Fish showed by histological studies that injury to the dentinal fibrils of the odontoblasts causes a reaction which affects the pulp to a degree corresponding to the severity of the injury.[9]

Since then, many investigators have shown that many filling materials, when placed in the dentin, cause adverse pulpal reactions, even to the extent of complete necrosis.[10-13] These degenerative changes occur frequently without any clinical symptoms such as pain, and are found only when a complete roentgenographic

9. Fish, E. Wilfred. An experimental investigation of enamel, dentine and the dental pulp. London, John Bale, Sons & Danielson, 1933.

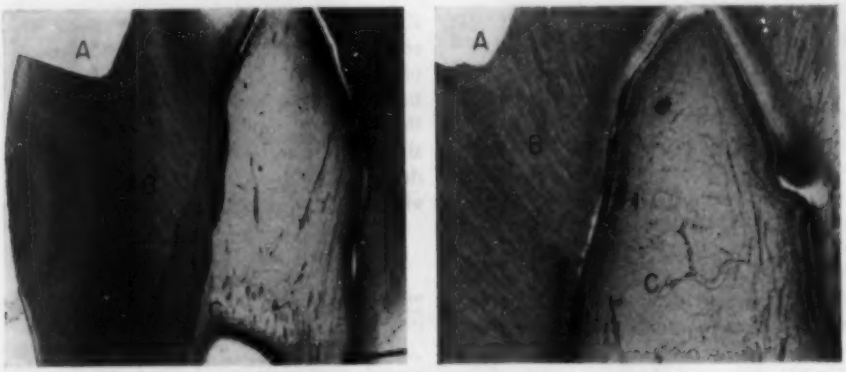

Fig. 4 • Left: Histologic section of human tooth, showing pulpal reaction ten weeks after silicate cement was placed in dentin; A, site of cavity preparation; B, dentin; C, inflammatory response. Right: Histologic section of human tooth ten weeks after calcium hydroxide mixed with methyl cellulose to form a thin suspension was used as a cavity liner under silicate cement; A, site of cavity preparation; B, normal dentin; C, vital pulp with normal pulp tissue

survey discloses a periapical radiolucency which may be interpreted as an abscess. It is necessary, therefore, to protect the dentin and pulp from such irritation. Recent investigations by Zander, Glenn, and Nelson show that, of all the lining materials tested according to their technics, only calcium hydroxide protects the pulp from chemical irritation.[14]

To determine the effectiveness of calcium hydroxide mixed with methyl cellulose as a dentin liner, the material was used under silicate cement. Figure 4, left, shows a histologic section from a human tooth, made ten weeks after the cavity was filled with only silicate cement. An inflammatory response such as that evident at C might become a chronic process and eventually result in necrosis of the pulp.

Figure 4, right, shows a histologic section from a bicuspid from the same patient ten weeks after the cavity was lined with calcium hydroxide mixed with methyl cellulose to form a thin suspension and then filled with silicate cement. The pulp is normal and healthy, free from inflammatory changes. This result is evidence of the protection against chemical irritation provided by this material when it is used as a dentin liner.

Because it is evident that a calcium hydroxide-methyl cellulose suspension not only helps stimulate the formation of new dentin when placed in direct contact with the pulp but also provides protection against chemical irritation to the pulp when used as a dentin liner and because it is easy to handle and therefore permits simplification of the procedures for pulp capping, pulpotomy and dentin lining, this material has been selected for use in the following technics in the treatment of Class II and Class III fractures.

TREATMENT OF CLASS III FRACTURES

The objectives of the treatment of Class III fractures are to promote the healing of the pulp, stimulate the growth of new dentin, protect the injured regions from further irritation and provide a durable and esthetic replacement for the lost dental tissue.

Because a pulp exposed by accidental trauma is probably contaminated and since a pulp can heal best if all damaged tissue and undesirable irritating stimuli are removed, pulpotomy, or partial removal of the pulp, rather than pulp capping is the preferred procedure.

1. Preparation for Pulpotomy • In any technic for performing a pulpotomy, it is imperative that asepsis be maintained. All cotton rolls, cotton pellets, sponges, instruments and burs should be sterile. It is convenient to use a molten metal sterilizer for cotton pellets and instruments before placing them in contact with the pulp.

Anesthesia is obtained with a local or general anesthetic, and the injured tooth is isolated with a rubber dam. The tissues are cleansed thoroughly of extravasations and other debris with any nonirritating cleansing solution, and the rubber dam is swabbed with quaternary ammonium compound or some other effective disinfecting agent.

2. Access • It is preferable to gain access to the pulp from the lingual surface of the incisor (Fig. 5, above left). A no. 6 or no. 8 round bur is suitable for this purpose. The entire pulp chamber should be outlined by thinning out the dentin to a point at which the pulp is visible but no hemorrhage is produced.

10. Manley, E. B. Experimental investigation into early effects of various filling materials on the human pulp. Proc. Roy. Soc. Med., Sec. Odont. 34:693 Sept. 1941.

11. Manley, E. B. A review of pulp reactions to chemical irritation. Internat. D. J. 1:36 Dec. 1950.

12. Shroff, F. R. Effects of filling materials on the dental pulp. New Zealand D. J. 42:99 July 1946; 42:145 Oct. 1946; 43:35 Jan. 1947.

13. Zander, H. A. The reaction of dental pulps to silicate cements. J.A.D.A. 33:1233 Oct. 1946.

14. Zander, H. A.; Glenn, J. F., and Nelson, C. A. Pulp protection in restorative dentistry. J.A.D.A. 41: 563 Nov. 1950.

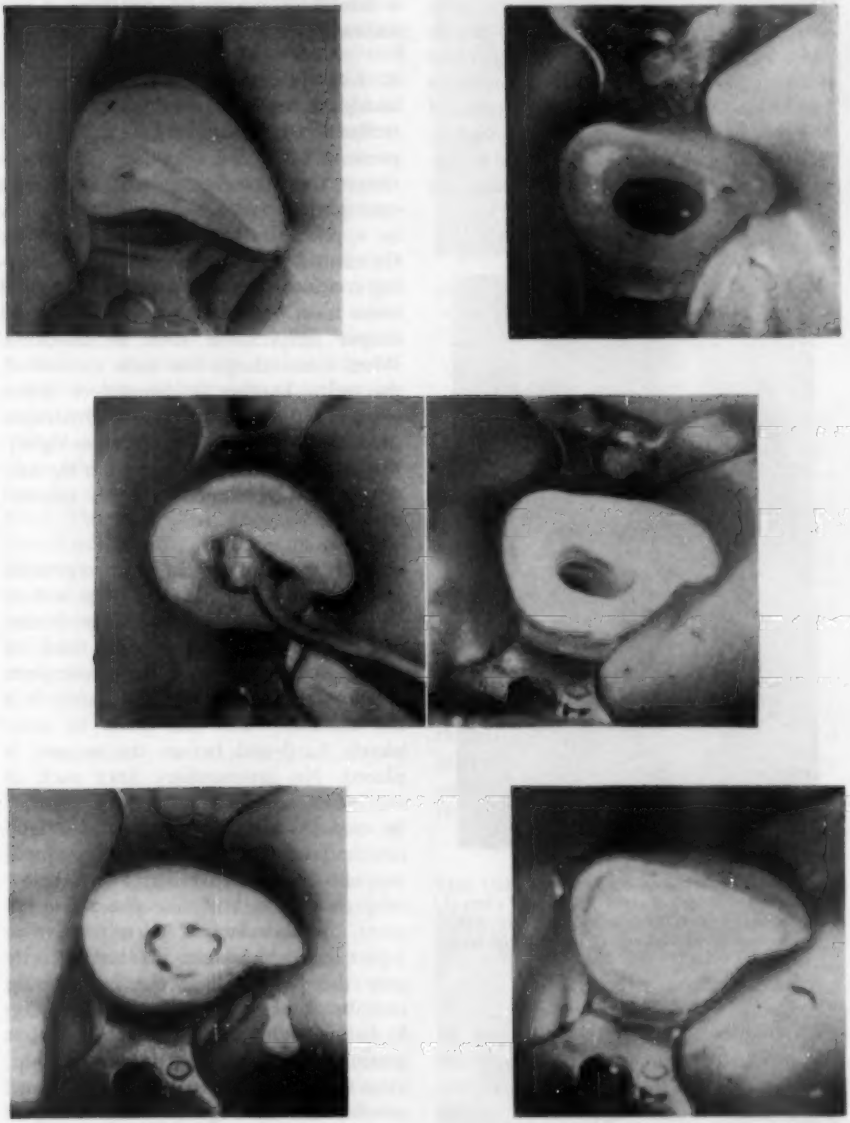

Fig. 5 • Above left: Class III fracture of maxillary right central incisor; lingual aspect isolated with rubber dam and clamp. Above right: Coronal portion of pulp exposed after removal of dentin from lingual aspect. Center left: Bulbous portion of pulp after excision with spoon excavator. Center right: Entire pulp chamber after amputation. Below left: Calcium hydroxide methyl-cellulose paste placed in chamber over amputated stump. Below right: Zinc phosphate cement over calcium hydroxide-methyl cellulose paste filling entire pulp chamber

It is desirable not to lacerate the pulp during this procedure. The thin dentin layer can be removed then in one piece with a spoon excavator, so that, without laceration, the entire coronal portion of the pulp is exposed (Fig. 5, above right). The coronal portion of the pulp is amputated and then peeled away from the pulp chamber. The amputation may be accomplished by placing a sharp spoon excavator along the lateral wall of the chamber to a point approximating the cementoenamel junction of the tooth and then cutting in a lateral or horizontal direction (Fig. 5, center left). Care must be taken not to rotate the excavator incisally because the pulp may accidentally become extirpated. A clean incision in a lateral or horizontal direction is one assurance of a successful outcome.

Fig. 6 • Healed maxillary central incisor with new dentin bridge; A, zinc phosphate cement; B, calcium hydroxide methyl-cellulose paste; C, new dentin or callus; D, vital pulp tissue

3. Control of Hemorrhage • If a clean incision is made, hemorrhage can be controlled in most instances by applying light pressure with cotton pellets. If hemorrhage persists, cotton saturated with epinephrine hydrochloride 1:1,000 may be applied. If these two procedures for the control of hemorrhage fail and bleeding continues, inflammatory or lacerated tissue must be present. A new, clean and deeper amputation then is indicated. When hemorrhage has been controlled, the pulp chamber is cleansed of debris with a 3 per cent solution of hydrogen peroxide and dried (Fig. 5, center right). A small amount of seepage from the amputated tissue should not be misconstrued as hemorrhage.

4. Pulp Protection • In order to provide suitable protection for the pulp and to stimulate the formation of new dentin, a layer, approximately 2 mm. thick, of calcium hydroxide-methyl cellulose paste is placed over the amputated stump. It is not necessary that this paste be completely hardened before the cement is placed. No intermediary liner such as zinc oxide and eugenol or wax should be used. A fine stream of air will help dry the paste and create a crust that will support a cement covering (Fig. 5, below left). A thin mix of zinc phosphate cement, approximately 2 parts powder to 1 part liquid by weight, is placed directly over the paste, filling the entire pulp chamber, and permitted to harden (Fig. 5, below right). It is imperative that pressures are not exerted on the pulp, since undue pressure will cause pain and possibly necrosis. Figure 6 shows a healed tooth in which the procedure as outlined was used. The new dentin layer can be seen at C.

A durable temporary crown may be used to replace the lost tooth structure until healing of the pulp has taken place.

Such a crown can be fabricated easily by adapting a cellulose acetate crown form of suitable size over the injured tooth and festooning it so that the form will extend beneath the free margin of the gingiva (Fig. 7). In most instances, no preparation of the tooth will be necessary. Occasionally, disking of the approximal walls with a fine disk may be desirable to break tight contact.

The occlusion should be checked with the crown form in place to make sure that satisfactory clearance is available when the teeth are closed in a centric relation as well as a protrusive incisal edge-to-edge relation. A thin mix of self-curing resin, approximately two parts of polymer to one part of monomer by weight, of a selected shade is flowed carefully into the crown form until it is completely filled. The resin-filled crown form is then forced over the fractured tooth until the form reaches its pre-established position. Care should be taken to remove the excess of resin which is forced subgingivally. This can be removed by running a sharp explorer around the crown form after it is seated and before the resin has set.

Fig. 7 • Cellulose acetate crown forms adapted over fractured incisors prior to filling with self-curing resin

TREATMENT OF CLASS II FRACTURES

The objectives of the treatment of Class II fractures are to provide protection for the pulp against undesirable chemical, thermal, and mechanical irritations and to provide a durable and esthetic replacement for the lost dental tissue.

The materials commonly employed to protect the pulp during healing are not suitable for use in the fabrication of temporary crowns because they do not have the inherent strength necessary to withstand the forces to which they are usually subjected and they do not blend with the natural color of the teeth. Because of the lack of resistance to crushing stress, such crowns are easily dislodged, and the additional undesirable irritation induced by repeated loss and replacement may result eventually in necrosis of the pulp.

The use of newer dental materials now makes it possible to provide an immediate esthetic and desirable replacement for the lost tooth tissue while maintaining adequate protection for the pulp. This double aim is accomplished by the use of calcium hydroxide-methyl cellulose paste, zinc phosphate cement and self-curing resins. The procedure is as follows:

The injured tooth is isolated with cotton rolls or by any other suitable method, thoroughly cleansed of extravasations and debris with hydrogen peroxide or any other nonirritating cleansing solution, and then dried. A very thin layer

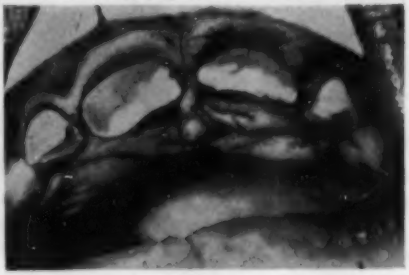

Fig. 8 • Class II fractures of maxillary central incisors protected with calcium hydroxide-methyl cellulose paste and zinc phosphate cement prior to placement of temporary crowns

of calcium hydroxide-methyl cellulose paste is placed over the exposed dentin and dried with a blast of air. A layer, approximately 1 mm. in depth, of a thin mix of zinc phosphate cement, approximately 1 part orthophosphoric acid to 2 parts powder, is then applied and permitted to harden (Fig. 8). The dentin is now protected against chemical, mechanical and thermal irritation.

To keep these protective agents in position until the pulp heals and to provide a replacement for the lost tooth structure, a durable temporary crown must be used.

The more desirable physical properties of self-curing resin, such as its greater strength, ease of manipulation, and color flexibility, make it an ideal material for fabricating this crown. The technic for preparing and placing this crown is the same as that described previously in the discussion of Class III fractures. Figure 9 shows fractured incisors treated and restored by this procedure.

SUMMARY

The purpose of this paper is to present simple procedures for the treatment of Class II and Class III fractures. The objectives of the treatment of these types of fractures are to maintain the vitality of the injured teeth and to provide durable, esthetic replacement of the lost dental tissues. The use of newer dental materials has made possible the development of simplified procedures.

In Class II fractures, vitality is maintained by protecting the dentin and pulp from undesirable irritation by the use of an efficient chemical barrier and a relatively durable temporary crown.

In Class III fractures, vitality is maintained by removing the contaminated pulp tissue and by using a stimulus to aid the pulp in the formation of new dentin.

Unless there is positive clinical or roentgenographic evidence that the pulp is necrotic and that definite degenerative

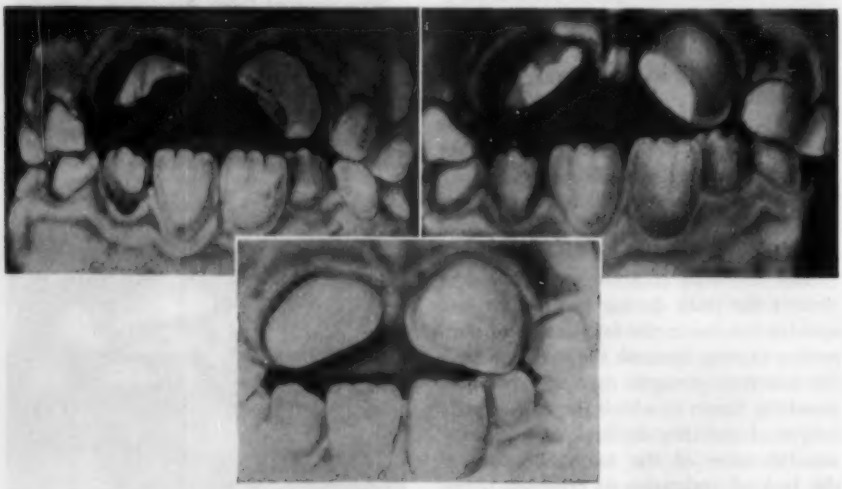

Fig. 9 • Above left: Class II fractures of maxillary central incisors showing injury prior to treatment. Above right: Protection of dentin of same teeth with calcium hydroxide-methyl cellulose paste and zinc phosphate cement prior to placement of temporary crowns. Below: Cellulose acetate crown forms filled with self-curing resin, restoring lost structure of same teeth

changes are in progress, protective and restorative treatment of Class II and Class III fractures should be undertaken.

CONCLUSIONS

1. The inflammatory processes due to traumatic injuries may make the patient's response to the electric pulp tester unreliable.

2. If arterial bleeding of the pulp is present or can be initiated, there is sufficient indication that the pulp is vital and therefore should respond to treatment.

3. When the pulp is exposed as a result of trauma, a pulpotomy should be performed as soon after the injury as possible.

4. A crown fabricated with self-curing resin provides an immediate, temporary, durable and esthetic protective covering for the materials used in the treatment of these fractures.

5. Calcium hydroxide-methyl cellulose paste provides stimulation to the pulp to form new dentin and protects the dentin and pulp from further irritation.

6. The use of calcium hydroxide-methyl cellulose paste simplifies the technics employed in pulp capping, pulpotomy and the lining of cavities.

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A method of temporomandibular joint roentgenography for serial or multiple records

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Many roentgenographic investigations of the temporomandibular joint have been attempted since the development of the cathode tube. Practically every investigator has emphasized the difficulty of obtaining an acceptable roentgenogram; and consequently, each has usually developed a different technic or apparatus to improve the roentgenographic result.

Norgaard[1] in 1947 and Ruskin[2] in 1952 described most of the major technics, variations of which are in general use today. Many valuable contributions to the literature on the roentgenography of the lateral aspect of the condyle were made from 1905 to 1948.[3-21] Lespine[22] in 1949 described an intraoral method, and Norgaard[1] in 1947 developed a technic in which he injects a contrast solution into the joint cavity. Some investigators[23-25] have used the methods of tomography and laminagraphy. Others[26-30] have em-

Department of orthodontics, Northwestern University Dental School.

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2. Ruskin, R. An evaluation of a technique and its implication in interpretation of radiographs of the temporomandibular articulation. Thesis for Master's Degree, Northwestern University, 1952.

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8. Sproull, J. Technique of roentgen examination of the temporomandibular articulation. Am. J. Roentgenol. 30:262 Aug. 1933.

phasized the importance of the frontal view of the condyle and described various technics to obtain such roentgenograms.

It is probably true that no one method is entirely adequate for all the uses for which a roentgenogram of the temporomandibular joint may be desired. The anatomist, the surgeon, the otolaryngologist, the dentist are all looking for different things in the shadow map. What is perfectly satisfactory to one does not tell the complete story to the other.

Anyone attempting for the first time to obtain a roentgenogram of the temporomandibular joint region is confronted with innumerable technics and methods advocated in the past and present literature. The simple fact that so many methods have been tried and reported points out that the problem under consideration is a difficult one and can be approached from many angles, each with a fair amount of success, but none with complete satisfaction.

Essential differences in the various technics seem to lie in one or more of the following factors:

1. Types of x-ray equipment used.
2. Area and direction at which the central ray enters the subject.
3. Film-target distance.
4. Positioning devices for subject and x-ray equipment.

Just as there are times when the little box camera takes as good pictures as the most expensive camera, so it is in roentgenology that the smallest x-ray machines are as valuable for certain tasks as the most powerful hospital machines. As it is not within the scope of this paper to delve into the technical aspects of x-ray machines, it is sufficient to note that if exposure speed is not too important or the target-subject distance is not too great, the very small dental type x-ray machine is the machine of choice; but if short exposure, high penetration and long film-target distance are important, the larger or more powerful machine is almost a necessity.

Practically any view of the condyle is possible; this discussion, however, is confined to the lateral profile view of the condyle. To obtain this view the central ray is aimed at the condyle under examination and may enter the subject at a variety of areas around or in the vicinity of the opposite condyle. Many different angles of entry, the angle depending on

9. Gillis, R. R. Roentgen-ray study of temporomandibular articulation. J.A.D.A. 22:1321 Aug. 1935.

10. Higley, L. B. A new and scientific method of producing temporomandibular articulation radiograms. Internat. J. Orthodont. 22:983 Oct. 1936.

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30. Eller, Virginia H. Frontal views of the mandibular condyles and angle view of the odontoid process. X-Ray Technician 22:238 Jan. 1951.

individual requirements, have been used successfully. The film-target and film-subject distances have little to do with the actual view under consideration but have much to do with the enlargement and distortion of that view. Positioning devices range from simple angle boards to elaborate head-holding and tube-positioning mechanisms.

Aside from actual physical limitations, the technic of choice depends on the use to be made of the temporomandibular roentgenogram and that in turn on how many roentgenograms are necessary.

Individual exposures have value in the examination and determination of pathological conditions, fractures, surgery and anatomical features. Multiple exposures are necessary to obtain functional records for oral reconstruction, prosthetic rehabilitation, periodontic treatment and orthodontic planning. Serial exposures are valuable for studies of stomatognathic function, growth studies and records of progress and treatment.

With all the technics available, individual exposures are limited only by the ingenuity and patience of the operator. Technically excellent roentgenograms should be available in each case. The necessity for multiple or serial roentgenograms, however, adds many difficulties. For multiple exposures, such as those used for orthodontic functional records, it is necessary to have not only roentgenograms which are technically interpretable but also a method whereby the subject can be held in the same plane for numerous exposures and preferably in a position whereby a physiologic rest position of the mandible is easily and efficiently obtained. In serial studies, an additional necessary condition is the provision for the repeated repositioning of an individual so that accurately comparable roentgenograms can be obtained.

After a considerable amount of experimentation and investigation of available technics, a technic employing the method and the apparatus developed by Lindblom in 1936[12] was found to fill the requirements most adequately. Lindblom showed that the central ray entering at 15 degrees above and 15 degrees behind the condyle closely followed the actual condylar position in the majority of cases and that a 24 inch target-film distance, a Lysholm grid, a dental x-ray machine and an adjustable 4 by 5 inch cassette holder produced technically satisfactory films. The major drawbacks were the fairly long exposure time, the small (4 by 5 inch) film area covered and the absence of a suitable head-holding and repositioning device.

During the process of experimentation, a technic called the right angle method was attempted by Donovan in 1950.[31] This method utilized a device attached to a dental chair, two ear rods were used for head alignment, and the x-ray machine was positioned as close as possible to the opposite condyle with the central ray passing through both condyles. The condyle nearer the target was enlarged greatly and so allowed a view of the condyle nearer the film. The resulting films were usually of suitable quality, but occasionally the fossa was unrecognizable; at times the condyle itself was hidden by superimposing structures.

DEVELOPMENT OF TECHNIC

In preliminary plans, it was decided that the temporomandibular joint roentgenographic method must possess the following qualities:

1. Provide an accurate view of the condyle from the mediolateral aspect.
2. Provide an accurate view of the articular fossa and eminence from the mediolateral aspect.
3. Provide an exposure area large enough to include orbitale, nasion and some maxillary and mandibular teeth.

31. Donovan, R. W. A roentgenographic study of various mandibular positions of children possessing excellent dental occlusion. Thesis for Master's Degree, Northwestern University, 1950.

4. Enable the subject to assume a relaxed upright sitting position.

5. Provide for the accurate repositioning of the subject for subsequent roentgenographic examination.

6. Maintain the same cassette, head and tube angulation for all subjects.

A careful examination of the literature and actual use of many of the technics indicated that none of them fulfilled all these qualifications. Consequently, the development of a new method was undertaken, the basis of which was the technic advocated by Lindblom.[12] The result was a device attached to the back of a Broadbent-Bolton cephalometer, utilizing the frontal or posteroanterior x-ray tube of the cephalometer (Fig. 1).

The x-ray tube was tipped down to an angle of 19 degrees from the horizontal and directed at the center of a large cassette holder, positioned perpendicular to the central rays and providing a 75 cm. target-film distance. To the cassette holder was attached a square sleeve and lock which firmly held a square tubular bar parallel to the floor and at a 15 degree angle from the central ray. From the bar extended a fixed plastic ear plug support, placed as close to the cassette as possible, and a movable support with an adjustable ear rod. A second square sleeve and lock were attached to the cassette holder in such a manner as to enable the positioning of the square tube and ear posts in order to take a roentgenogram of the opposite temporomandibular joint. When seated upright and in a comfortable position on an adjustable stool, the subject was so situated that the central rays entered above and behind the ear and passed through the condylar region on the opposite side.

The device which was developed consisted of a fixed x-ray tube, a fixed cassette holder and a head-positioner. Kodak Blue Brand film was used in 8 by 10 inch cassettes equipped with fine definition intensifying screens. To eliminate some secondary radiation and to provide greater contrast, a Lysholm type grid was used. The General Electric D-3 head delivering approximately 85 kv.p. and 20 milliamperes allows an exposure of only three fourths of a second.

The accuracy of the Lindblom technic has been tested many times and the area of the fossa and condyle outline determined. The present technic, used with a slightly different vertical angulation and the addition of the head-orienting device, was thoroughly tested by Ruskin in 1952. His conclusions were:[3]

1. The Donovan orientating device permits accurate duplication of temporomandibular joint radiographs.

2. The center of the condyle and the height of the fossa may be related to an axis within the skull.

3. The angle which the projected section of the condyle describes with the transverse axis has a great range of variability due to individual morphology and angular relationships of the condyle.

4. In every skull examined in this study the junction of the lateral and middle thirds of the fossa formed the lower border of the fossa as seen on the radiographic projection.

5. It is, therefore, not possible to measure the actual distances between points on condyle and fossa from only the temporomandibular joint radiograph.

6. The mediolateral distances between corresponding points on the condyle and fossa compare favorably with the thickness of the sections obtained by use of laminagraphy.

7. The distance between any two points on the condyle, measured on a temporomandibular joint radiograph, remains constant during rotation from rest to occlusal position despite the fact that the transverse axis describes a horizontal angle of 15° and a vertical angle of 19° with the hinge axis.

OPERATIONAL TECHNIC

Any orienting device is only as good as the operator. Consistently accurate results are obtained only with a thorough understanding of the problem under investigation and the development of a smoothly functioning operational technic. The most important procedures in the present technic as finally developed are

the positioning of the subject and the securing of the tracing.

Positioning Subject • It has been found that the following four mandibular positions are adequate for routine temporomandibular joint examination: (1) physiological rest position, (2) occlusal or intercuspal position, (3) retruded position and (4) incisal position.

After the subject has assumed a relaxed upright sitting position, with his head in the orienting device and the Frankfort plane parallel with the floor, the subject is asked to wet his lips, swallow and then to "unstick" his lips. A few

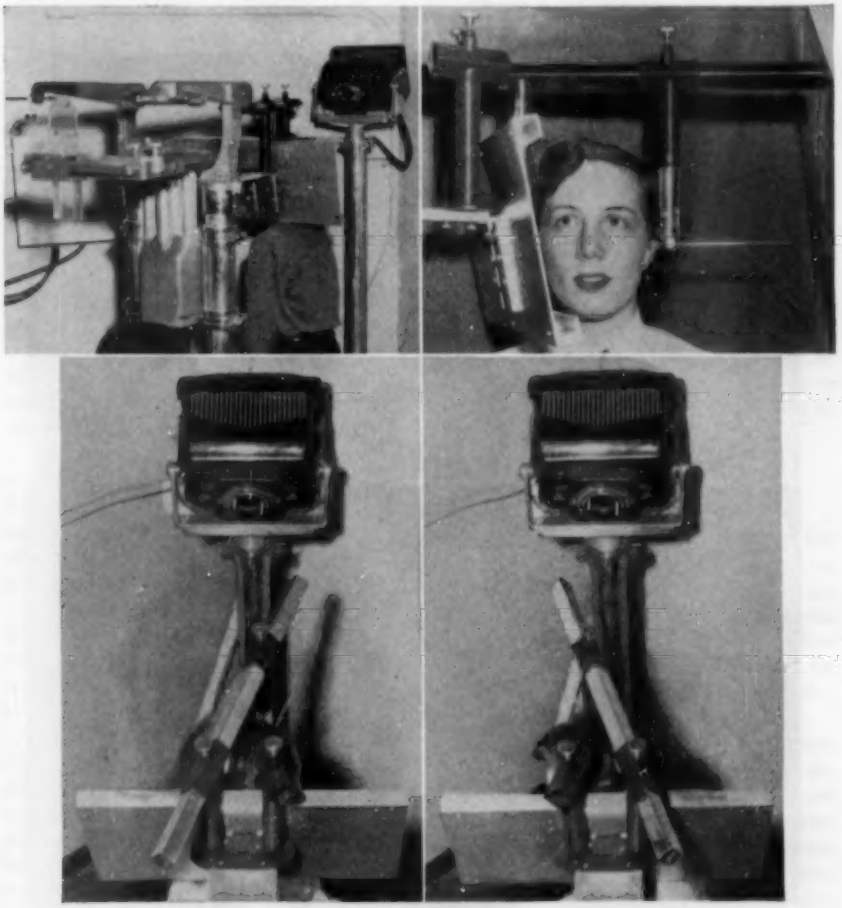

Fig. 1 • Above left: Temporomandibular joint orienting device, attached to back of Broadbent Bolton cephalometer with P-A tube tipped 19 degrees below horizontal. Above right: Patient positioned for exposure of right temporomandibular joint. Below left: Position of machine for right joint exposure. Below right: Position for left joint exposure

seconds later the first exposure is made; the subject, with the lips still parted, is then asked to "hold still," and the rest position is checked. If the lips appear easily parted, the teeth slightly separated and the tongue "creeping" between the teeth, the rest position is assumed to be correct. The vast majority of the subjects very readily assume the rest position; only a very few must be put through a conversational routine or be told to relax the facial muscles.

After the rest position exposure, the subject is asked to close the jaws until the teeth are together in full intercuspal occlusion. After the occlusal position exposure, the subject is asked to pull the lower jaw back and repeatedly tap the posterior teeth together on an opening arc of approximately 10 mm. When the

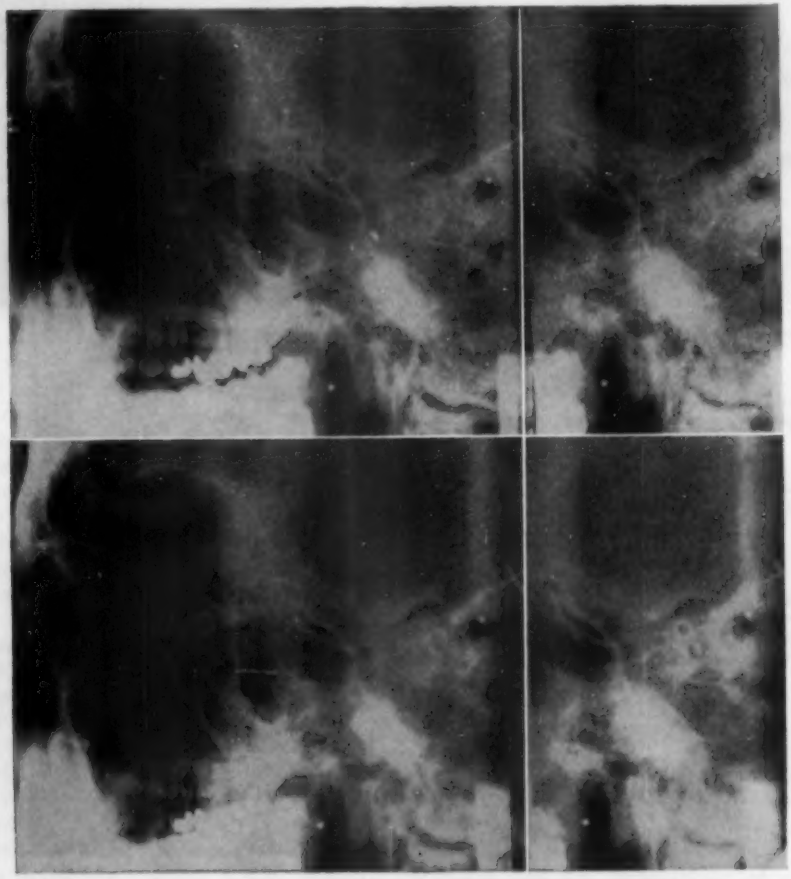

Fig. 2 • Roentgenographic series of right temporomandibular joint. Above left: At rest position. Above right: At occlusal position. Below left: At retruded position. Below right: At incisive position

subject has reached the posterior limit of the tapping range, he is asked to hold the jaw at the position of the last tap for the third exposure. At no time does the operator or the subject touch the chin to guide the retrusion of the jaw, and in no subject is the retruded position beyond the range of easy opening and closing movement.

The fourth exposure is made with the incisors in an edge-to-edge position; then the subject is turned around, and the head holder is adjusted for similar exposures of the opposite temporomandibular articulation.

Tracing • A temporomandibular joint roentgenographic series worth taking deserves careful interpretation. The first step in interpretation is accurate tracing. Without the tracings, the roentgenograms are more of photographic interest than of clinical value (Fig. 2).

The rest position roentgenogram is placed over a suitable illuminated tracing box; and with a very sharp, hard pencil, various landmarks are traced on a sheet of tracing film. These landmarks are the orbitale point, the center of the outline of the auditory meatus, the outline of the articular eminence and fossa, the outline of the condyle and neck, and several prominent bony landmarks (Fig. 3).

The arc formed by the superior outline of the condyle is continued to form a complete circle, the center of which is marked by a small dot. A template is made of the outline of the condyle and carefully fixed with tape to the outline of the condyle on the occlusal position roentgenogram. The full tracing is superposed over the eminence, the fossa and other landmarks; and the position of the condylar "dot" is transferred to the full tracing. The same procedure is followed with the roentgenograms of the other positions so that the final tracing exhibits the landmarks and the condyle dot at rest position, occlusal position, retruded position and incisive position.

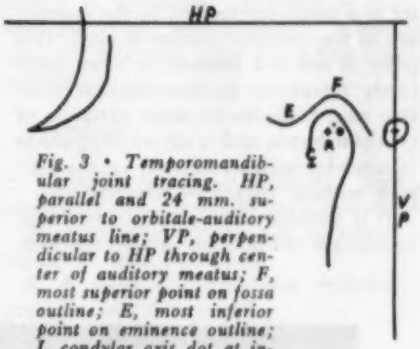

Fig. 3 • Temporomandibular joint tracing. HP, parallel and 24 mm. superior to orbitale-auditory meatus line; VP, perpendicular to HP through center of auditory meatus; F, most superior point on fossa outline; E, most inferior point on eminence outline; I, condylar axis dot at incisive position; R, condylar axis dot at physiologic rest position; O, condylar axis dot at occlusal or intercuspal position

To determine the relation of the condyle to the skeletal landmarks, the entire condylar outline should be traced for each mandibular position; but to determine the relation of one condylar position to another, only the condylar dot needs to be recorded.

DISCUSSION

The condyle, fossa and eminence on the tracing represent the shadow outlines on the roentgenogram. Because of the inclination of the x-ray tube and the three dimensions of the objects, the shadow outline of the roentgenogram should be identified for interpretation and orientation.

In the study a fine wire attached to the condyle on a skull and another wire attached to the eminence and fossa were moved until they fell exactly over the roentgenographic condyle and fossa shadow outline. After this procedure was repeated on many skulls, the roentgenographic outline was found to be a section through the junction of the middle and lateral thirds of the articulation (Fig. 4).

For the most accurate work, the cen-

ter of a circle determined by the superior arc of the condylar outline is used. This point is selected because it most accurately represents an intercondylar rotation axis, it eliminates some variation of condylar forms, and it allows comparison of condylar position between various subjects without regard to condylar size.

It is obvious that condylar size, shape, inclination and position vary greatly from subject to subject; it is true also that the fossa and eminence vary in size, shape, inclination and position. Not as obvious, but nevertheless characteristic, is the asymmetry of the condyle, fossa and eminence within the individual. Because of these variations, it is impossible to obtain a useful profile view of the relation of the condyle, eminence and fossa in all cases.

Fig. 4 • Region of condyle and fossa and its appearance in shadow outline on temporomandibular joint roentgenogram

A predetermination of inclinations for each case is usually ruled out because of the overexposure to radiation and the complexity of technic which would be involved; and even if they should be determined in advance, it would be found that for a certain percentage of subjects the predetermined inclinations would result in roentgenograms that would be unreadable because of the superimposition of more dense structures. It seems wise, therefore, to place less emphasis on the actual measurement of the articular space, in particular, the space between the condyle and the eminence and the fossa, and more emphasis on the relation of one condylar position to another condylar position. In other words, a functional analysis utilizing various terminal reference positions, rather than a static analysis of joint structure, provides greater accuracy and a wider range of usefulness for temporomandibular joint roentgenograms.

This method has passed the preliminary research stage and possesses definite clinical applications.[32] Oriented temporomandibular joint roentgenograms, employed to determine treatment of the malfunctioning stomatognathic system, have an important place in routine case analysis.

SUMMARY

1. Various temporomandibular joint roentgenographic methods were reviewed.
2. A modified technic and an orienting device were developed.
3. A series of mandibular reference positions was determined.

CONCLUSION

1. A well-developed tracing is essential for accurate interpretation.
2. The usefulness of temporomandibular joint roentgenograms depends far more on functional analysis in terms of reference positions than on static analysis of joint structure.

636 Church Street

32. Donovan, R. W. A cephalometric and temporomandibular joint radiographic study of normal and abnormal function of the temporomandibular joints. Dissertation for Ph.D., Northwestern University, 1953.

Political Bodies • Experience proves that political bodies, like the animal economy, have their infancy, youth, maturity, decay, and dissolution. . . . When they have reached a certain point of greatness, their taste and manners begin to be infected. Their prosperity inflates and debauches their minds. It betrays them into pride and avarice. . . . These, with other kindred vices, hasten their downfall and ruin. ***David Tappan, 1798.***

Some observations of the oral roentgenologist

Lee Roy Main, D.D.S., St. Louis

There is at least a grain of truth in the old adage that "the thermometer of dentistry registers in the office of the roentgenologist." Twenty-five years of service in oral roentgenology provides a vantage point from which to view trends in dental practice. In some localities certain phases of dental work are emphasized; in others different phases are stressed. For example, there are communities where gold foil fillings are inserted regularly by the average dentist, whereas elsewhere a practitioner who uses gold foil is rare. So it is with root canal therapy and with surgical treatment of periodontal disease. In many European countries orthodontics is the only specialty fully recognized. It happens, therefore, that there are localities where practitioners believe in and support dentists who restrict their time and effort to oral roentgenology.

The subject of roentgenology is taught to the undergraduate just as all other phases of dentistry. Every practitioner must be prepared to make an adequate diagnosis. Usually it is impossible to make a complete, thorough diagnosis without information supplied by roentgenograms. If the dentist is too busy with other work or if the diagnosis is difficult, the dentist should be able to refer his patient for diagnosis to a specialist trained and skilled in the use of x-ray equipment. Many practitioners are now accustomed to sending their prosthetic work to a commercial laboratory; it is equally time-saving for a practitioner to send his roentgenographic work to a roentgenologist.

The following are some of the weak points in roentgenographic work as it is now all too frequently performed: (1) For certain regions not enough films are used. (2) Frequently the films are too dark. (3) The angulation employed is not wisely selected. (4) The processing solutions are too old or too hot. (5) The dentist is usually too busy to give the time necessary for excellent results.

The patient is entitled to thorough service in this phase of dentistry as well as in other phases. Unsatisfactory work from a prosthetic laboratory would not be tolerated; yet frequently poor roentgenographic results are accepted because the dentist does not have time to do first-class work.

It has been said, "A good clear roentgenogram is difficult to interpret, a poorly made roentgenogram is impossible to read." One rule to be observed in the making of roentgenographic exposures is that enough projections on suitable and appropriate films should be used to reveal the necessary structures clearly. Distortion must be minimized or entirely eliminated, and the finished films must have

Presented before the Section on Roentgenology, ninety-fourth annual session, American Dental Association, Cleveland, September 28, 1953.

the proper density. In some instances, intraoral films of conventional size must be supplemented as shown in Figure 1 with films of larger size, the occlusal regular film or the 5 by 7 inch or sometimes the 8 by 10 inch extraoral film. The regular intraoral film is scarcely large enough to include all the involved bone.

Fig. 1 • Insert: Radiolucent shadow indicating area of cystic degeneration. Figure: Same area projected on 5 by 7 inch film, revealing additional information with no distortion

ROENTGENOLOGY AND CONSERVATIVE DENTISTRY

The dentist must keep in mind that his first responsibility is to his patient—the maintenance of factors in his general health and especially the conservation of his dentition. Since artificial substitutes seldom compare favorably with the natural teeth, the patient must be encouraged to save his own teeth. Sometimes a dentist is a "little too quick" in reaching for the forceps; even in extreme

Fig. 2 • Repair of bone in deciduous molar that had an involved pulp. (Courtesy of Vasil Vasileff)

cases it is sometimes not too late to perform conservative work. Figure 2 shows what was accomplished in such a case. The deciduous molar had an involved pulp with evidence of periapical change. The permanent molar had not erupted sufficiently to be used as a support for a maintaining appliance which would have

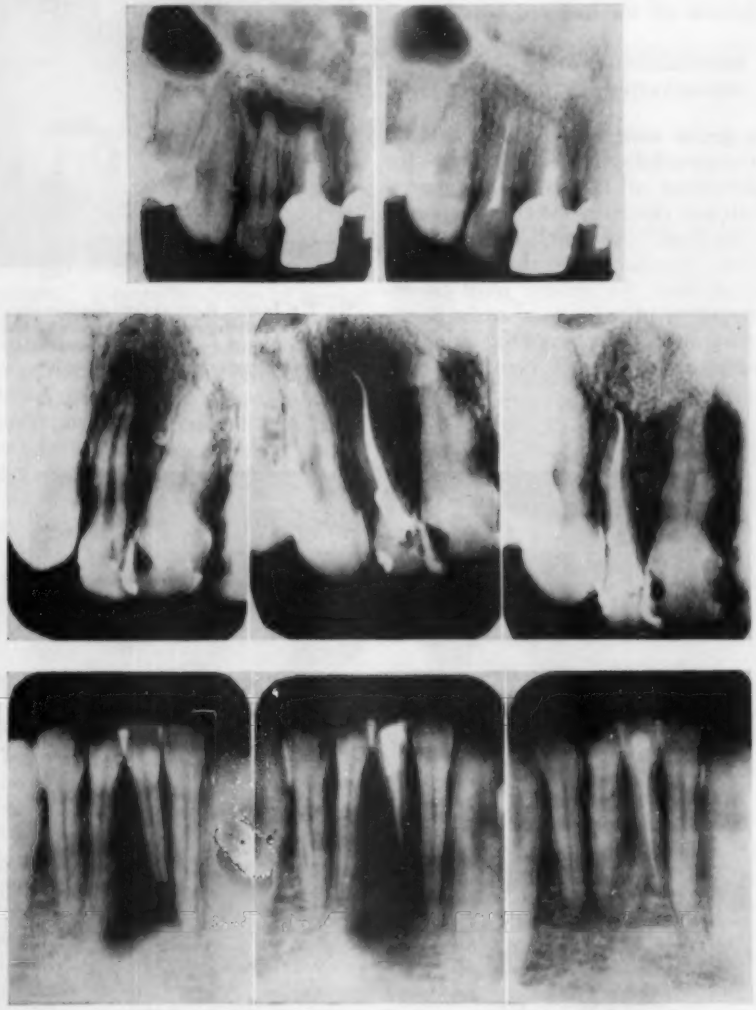

Fig. 3 • Above: Before and after treatment of canal. Center left: Before treatment. Center center: Immediately after treatment. Center right: 5 years after treatment. Below left: Before treatment. Below center: Immediately after treatment. Below right: 18 months after treatment

been desirable to prevent a partial collapse of the lower arch. By means of canal therapy the deciduous molar was cleared of periapical destruction and could be retained successfully long enough to prevent any irregularity of the permanent teeth.

Figure 3 shows three cases in which thorough canal therapy had a favorable response. These cases were treated by three different general practitioners, who were not specialists. The indication is that proper canal therapy usually has such a favorable response.

Every experienced dentist knows that there are cases in which nothing can be used except a partial denture. In such a case the dentist must see to it that the clasps employed to stabilize the denture do not cause further loss of tooth structure. Entirely too frequently the contact of the clasp with sound tooth structure has an abrading effect, and further extractions become necessary because of wear. Since protection against wear can be provided, the patient should be instructed as to the measures he himself should take to prevent conditions such as those shown in Figure 4.

Prevention in dentistry is a familiar and important phrase, which has several connotations. It may call to mind the re-

Fig. 4 • Above: Abrasion on distal surface of second bicuspid due to clasp after partial denture was in use less than 2 years. Center left: Carious conditions that developed in case where lower bicuspids and upper right cuspid were used for clasping. Denture was in use for 2 years. Center right: Breaking down of enamel near cervical surface in upper right central incisor and in upper right bicuspids. Denture was in use for 4 years. Below: Extensive caries in lower bicuspid resulting from clasps

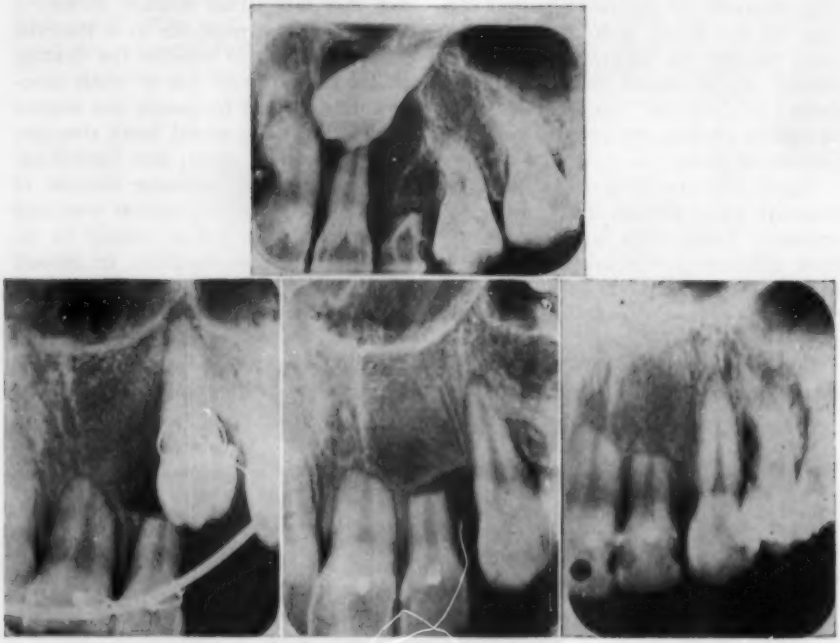

Fig. 5 • Above: Condition on May 16, 1929. Below left: Retraction of cuspid on February 28, 1931. Below center: Cavity in mesial surface of lateral tooth as it appeared June 22, 1931. Below right: Remarkable bone rebuilding evident in checkup June 28, 1949, 20 years after first examination. (Courtesy of Frank B. James)

searcher, who is busily engaged in endeavoring to find the cause of abnormal conditions. The alert practitioner, with prevention as a goal, seeks to detect caries early in order to conserve as much tooth structure as possible, endeavors to retain the supporting structures of the teeth when periodontal diseases make their initial attack, or intercepts an evident irregularity in the incipient stage and thus renders a permanent service. Figure 5 shows how preventive dentistry preserved a lateral incisor and an unerupted cuspid in a case where both teeth were extensively involved when the patient was 11 years old. Through care and cooperation of the patient, the result was still successful after 20 years.

COMMENT

From the viewpoint of the oral roentgenologist, dentistry is a health service, of which prevention is an extremely important aspect. The dentist should never lose sight of the fact that his chief responsibility is to conserve the human dentition. One of the most effective instruments in conservative dentistry is the roentgenogram, properly taken and correctly interpreted.

3556 Caroline Street

Thiamylal sodium as an anesthetic for the office practice of oral surgery

Allyn S. Abramson, D.D.S., Los Angeles

The use of ultra-short-acting barbiturates for intravenous anesthesia has become increasingly popular in the office practice of oral surgery. Up to now, thiopental sodium has been the agent most extensively employed for this purpose. The present report is concerned with a clinical evaluation of the use in oral surgery of a new agent of the thiobarbiturate group, thiamylal sodium (Surital),[1] which, when judged by the reports of clinical studies of its use in general anesthesia,[2-7] has proved to have several advantages over thiopental sodium. Chief among the advantages are the rapid induction and recovery and the low incidence of laryngospasm, respiratory depression, hypotension, and postoperative nausea and vomiting. For these reasons, thiamylal sodium seems to be a more satisfactory agent for office use. The following studies were conducted in order to evaluate it for this purpose.

METHOD

Seventy-six patients, taken at random, all of whom required a general anesthetic for oral surgery, were used in this study. The patients were divided into two groups, 38 in each. There appeared to be no obvious differences between the patients that would affect the anesthesia, and the type of oral surgery needed was sufficiently similar to justify comparison of the effects of the drugs.

Premedication consisted of the intravenous injection of 0.03 mg. (1/200 grain) scopolamine hydrobromide, 25 mg. meperidine and 20 units of chondodendron tomentosum extract, purified (Introcostrin). The needle was retained in the vein, and the syringe was replaced by a lead tube from a calibrated glass reservoir which contained a 2.5 per cent solution of the anesthetic (Fig. 1). The diluent was physiological sodium chloride solution. Intermittent administration was used throughout the procedure, and the flow was controlled by means of a clamp on the apparatus. As a test dose, 1 cc. of the solution was introduced. After one minute, if no untoward reaction occurred, 4 to 6 cc. was administered. Then an additional solution (1 to 3 cc.) was given

1. The Surital Sodium used in this study was supplied through the courtesy of Parke, Davis & Co.

2. Helrich, M.; Pepper, E. M., and Rovenstine, E. A. Surital sodium: a new anesthetic agent for intravenous use. Preliminary clinical evaluation. Anesthesiology 11:33 Jan. 1950.

3. Dillon, J. B., and Denson, J. S. Clinical trial of Surital sodium, a new intravenous barbiturate. Report of 700 cases. Ann. West. Med. & Surg. 4:172 April 1950.

4. Spencer, W. A., and Coakley, C. S. Clinical impressions of a new intravenous barbiturate, Surital sodium. M. Ann. District of Columbia 20:59 Feb. 1951.

5. Kirchhof, A. C. Clinical evaluation of Surital. West. J. Surg. 59:90 Feb. 1951.

6. Dornette, W. H. L., and Tuohy, E. B. Clinical trial of Surital sodium in 1200 cases of general anesthesia. Anesth. & Analg. 30:159 May-June 1951.

7. Lund, P. C. Surital sodium: a new intravenous anesthetic. Am. J. Surg. 81:637 June 1951.

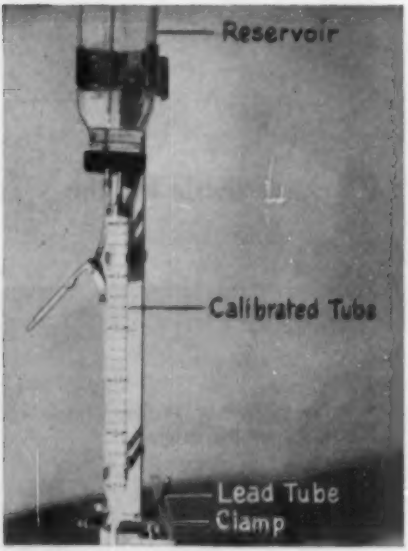

Fig. 1 • Lead tube from calibrated glass reservoir which contains anesthetic. Flow controlled by means of clamp on apparatus

as required to maintain the desired level of anesthesia. The concentration and method of administration of the two drugs were identical.

RESULTS

Loss of consciousness, as determined by the eyelash test, was produced by a smooth and rapid induction period (three minutes). During the induction period, most patients experienced a slight dizziness and a feeling of "floating in space." After the initial induction, the surgical plane of anesthesia was more easily maintained with thiamylal sodium than with thiopental sodium. There were no untoward complications such as laryngospasm, respiratory and circulatory depression, mental excitement or depression. One patient complained of postoperative nausea that lasted approximately 20 minutes. Several patients, while under thiopental sodium anesthesia, required the rapid addition of considerable quantities of the anesthetic in order to maintain the surgical plane of anesthesia. In all cases, with both drugs, recovery was sufficiently rapid so that the patient, after receiving black coffee as a stimulant, was able to leave the office with an escort within the hour.

Pertinent data regarding time and the amount of anesthetic used are contained in the table. Figure 2 shows a comparison of the dosage, depth and duration of anesthesia produced with thiamylal sodium and with thiopental sodium, as found in this study. The depth was judged by smoothness in the maintenance of the desired plane of anesthesia.

DISCUSSION

A major advantage gained when thiamylal sodium is used is the ease with which the surgical plane of anesthesia is

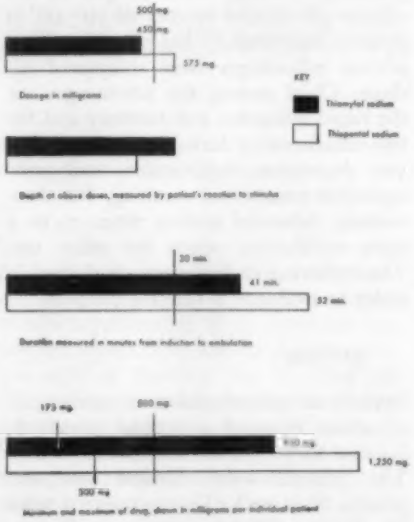

Fig. 2 • Ratio of one agent to the other agent in terms of dosage, depth and duration. Average for 38 patients

Table • Amount of anesthetic used and induction and duration time

Drug	No. of cases	Average amt. per patient (mg.)	Individual patient Low (mg.)	Individual patient High (mg.)	Induction (min.)	Surgery (min.)	Returned reflexes (min.)	Ambulatory after returned reflexes (min.)	Total (min.)
Thiopental sodium. . .	38	551	300	1,250	5	11	12	24	52
Thiamylal sodium. . .	38	450	175	950	3	11	8	19	41

maintained. The patient should be as lightly anesthetized as possible without creating a situation conducive to the production of a laryngospasm. The potency of thiamylal sodium allows the rapid return to the desired plane of anesthesia by the addition of small amounts of the drug (1 to 3 cc.) without a reinduction of the patient. If a patient exhibited signs of returning reflexes while under thiopental sodium anesthesia, it was necessary to reinduct the patient almost completely by rapidly adding 4 to 8 cc. of thiopental sodium in order to return him to the desired level of anesthesia. Thus a tendency to stimulate the laryngeal reflexes was created.

SUMMARY

A clinical study was made of two groups of 38 patients each, taken at random, who were administered thiamylal sodium and thiopental sodium, with scopolamine hydrobromide, meperidine, and chondodendron tomentosum extract, purified, as anesthetics in order to determine the effectiveness of these drugs for the office practice of oral surgery. The following conclusions were drawn:

1. Induction is smoother and slightly more rapid with thiamylal sodium (Surital).
2. Laryngeal reflexes are less apt to occur with thiamylal sodium than with thiopental sodium.
3. Recovery after thiamylal sodium is smoother, and the patient becomes ambulatory sooner.
4. The greater potency of thiamylal sodium permits the subject to be carried in a lighter plane of anesthesia, since the addition of only small amounts of anesthetic (1 to 3 cc.) is needed to maintain the surgical plane when reflexes return prematurely.
5. There were no uncontrollable complications during induction or recovery, in either group of patients.
6. Thiamylal sodium is an effective intravenous anesthetic and possesses several advantages for the oral surgeon.

ADDENDUM

This study of the effects of thiamylal sodium now comprises more than 80 patients. The only noteworthy new observation is that less of the anesthetic is being used per patient. There was no change in the procedure, but the subsequent cases averaged 270 mg. per patient as compared with the 450 mg. previously reported. This probably can be accounted for by the fact that the anesthetist has become more familiar with the potentialities of the new agent.

6363 Wilshire Boulevard

Old Books • I keep to old books, for they teach me something; from the new, I learn very little. *Voltaire.*

Clinical application of newer anesthetic agents in minor oral surgery

Morgan L. Allison, D.D.S., Columbus, Ohio

In the past 20 years rapid and far-reaching advances have been made in the use of general anesthetics. These advances have been accepted slowly by the dental profession in its training centers, a fact which creates both a moral obligation and a legal problem in regard to the use of general anesthetics by dentists. It is extremely important that our dental colleges and hospitals with dental training programs accept advances in general anesthetics and take the responsibility for instructing their students in their use.

The time has passed when asphyxial combinations of oxygen in low percentages and anesthetic agents in high percentages are administered in a dental office. Legal regulations will soon prohibit a dentist from using a general anesthetic with a low percentage of oxygen and will require that the dentist employing anesthesia be familiar with and capable of using many of the new anesthetic agents and supplements.

Credit must be given to the many dentists who are anesthetists and who have led our profession in recognizing indications and mastering technics for the use of the new agents. As a group, however, dentists who administer anesthetics have been slow in accepting the advancements that are necessary to make it morally and legally right for the profession to use general anesthetics. Any dentist who wishes to use general anesthetics must investigate the action and use of these new agents. The young dentist or dental student must be encouraged to take sufficient postgraduate training to qualify himself thoroughly in the use of all these agents before he attempts to employ general anesthesia in his practice.

THIOPENTAL SODIUM

Thiopental sodium (Sodium Pentothal) as an induction agent in general anesthesia has been used countless times by dentists for 17 years but must be considered a new agent for dental anesthetists as a group because the vast majority of dental anesthetists are not trained to use it.

Thiopental sodium is not an anesthetic agent but a hypnotic when used in dosage sufficient to cause the loss of consciousness and should be employed for this purpose and not substituted for an anesthetic agent. Thiopental sodium like other barbiturates does not reduce pain reflexes except when used in sufficient doses to depress the central nervous system and cause loss of consciousness. It

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Chairman, oral surgery and anesthesia, College of Dentistry, Ohio State University.

is possible that oral surgical procedures which last only one or two minutes can be performed satisfactorily after the induction of sleep with thiopental sodium without the aid of other agents; however, if it is anticipated that a procedure will last more than one or two minutes, the action of thiopental sodium should be supplemented by inhalation anesthesia.

In a study at the Henry Ford Hospital[1] the effects of the use of thiopental sodium for surgical procedures with the patient breathing room air were compared with the effects of the use of thiopental sodium for induction and nitrous oxide and oxygen for maintenance of anesthesia. When thiopental sodium was used for induction and nitrous oxide and oxygen in a ratio of 70:30 for maintenance of anesthesia, the arterial oxygen saturation remained normal or above normal. When thiopental sodium was used for induction and the patient breathed room air, the arterial blood oxygen saturation fell to as low as 68 per cent.

Clinical experience with the use of thiopental sodium for induction and nitrous oxide and oxygen for maintenance of anesthesia indicates that 80 per cent nitrous oxide and 20 per cent oxygen is a safe combination for the maintenance of anesthesia. Results at the Ohio State University differ from those obtained by McClure and his co-workers perhaps because dental patients from the Ohio State University outpatient department do not have premedication which tends to reduce minute volume, their cardiac and pulmonary conditions are healthy, the nitrous oxide and oxygen mixture delivered from the machine has a stimulating effect on respiration, and the depth of anesthesia is surgical plane one, which does not depress respiration.

Thiopental sodium can be used for induction of anesthesia in almost all patients, except those in shock and those with known hypersensitivity or allergy to thiopental sodium. Thiopental sodium is a respiratory and circulatory depressant and must never be given to a patient with a drop in blood pressure produced by any type of shock.

There is no contraindication as to age, although extremes in age warrant exceptional care in the use of the drug. Use of this drug is not ordinarily satisfactory for children under the age of eight because of the problem of cooperation and the difficulty of venopuncture. As a hypnotic agent, administered rectally, it is frequently employed even for children under the age of one.

Perhaps the greatest danger in the use of thiopental sodium is that it produces loss of consciousness so readily that it appears easy for the untrained dental anesthetist to use it; however, serious consequences, such as laryngeal spasm, can arise from the use of thiopental sodium if the anesthetist has not been trained sufficiently in the use of thiopental sodium and the drugs and equipment necessary for laryngoscopy and endotracheal intubation. Certainly there will be no legal recourse for the dentist who has an accident after the administration of thiopental sodium if he cannot show definitely that he has been properly trained and is sufficiently skillful to control laryngeal spasm, to make a laryngoscopy and to perform an endotracheal intubation with dexterity.

Thiopental sodium when used for induction is ordinarily administered in a 2½ per cent solution. Weaker solutions require too great a volume of the agent, and stronger solutions may cause tissue necrosis or sloughing if there is infiltration of thiopental sodium outside the vein. Induction with a 2½ per cent solution of thiopental sodium is very rapid, depending on the rate of injection. The average interval of induction is about 10 to 30 seconds.

1. McClure, R. D.; Behrmann, V. G., and Hartman, F. W. The control of anoxemia during surgical anesthesia with the aid of the oxyhemograph. Ann. Surg. 128:685 Oct. 1948.

A test dose of thiopental sodium should always be administered to rule out any possible hypersensitivity to the agent. This test is accomplished by injecting 2 cc. of 2½ per cent solution of thiopental sodium into the vein; if the patient is hypersensitive to thiopental sodium, within the first 15 seconds he will lose consciousness, have a drop in blood pressure, and show serious respiratory depression. Thiopental sodium is discontinued if these reactions appear.

If the patient is not hypersensitive to thiopental sodium, he will experience little or no reaction to the administration of this dose. After the test dose, a 2½ per cent solution of thiopental sodium is administered, 1 cc. per second until the desired result is obtained. In the author's experience, the average dose of the 2½ per cent solution for the average individual is 16 to 20 cc., or 6 to 7½ grains. This dosage produces loss of consciousness and maintains the patient in anesthesia with the combination of nitrous oxide 80 per cent and oxygen 20 per cent for short oral surgical procedures. If the patient reacts to the stimulus of the surgical procedure, then more thiopental sodium can be added according to his individual requirement.

Laryngeal spasm is an involuntary closure of the vocal cords interfering with the exchange of gases from the lungs through the upper respiratory passages. A spasm of this type generally occurs when there is excessive stimulation of the sensory fibers of the vagus nerve during anesthesia. The inhibitory influences which normally balance vagus stimulation are reduced or annulled after the administration of thiopental sodium. Therefore, atropine should be used routinely before the administration of thiopental sodium.

Atropine is a belladonna drug which reduces vagal reflexes, increases heart rate, decreases the production of saliva and mucus, and dilates the pupils. Reactions of patients who are hypersensitive to it are flushed face, increased body temperature and severe disorientation; however, side reactions from atropine are seldom observed when thiopental sodium is administered immediately after atropine. Thiopental sodium counteracts the action of atropine (1) by lowering body temperature, (2) by decreasing central nervous system activity—thus tending to prevent an increase in heart rate—and (3) by producing loss of consciousness—thus preventing disorientation.

The dose of atropine depends on the age and size of the patient, the average dose being 1/150 grain administered intravenously. Immediately after this dose, the 2 cc. test dose of thiopental sodium is given. The dilation of the pupil may persist after recovery from anesthesia, and the patient may be distressed or confused because of his inability to focus properly. In such a case the patient should be told why he is unable to focus properly and that this reaction will wear off within a short period of time. Careful attention should be given to all patients.

Immediately after induction with thiopental sodium, nitrous oxide and oxygen 80:20 are administered to the patient through the nose mask. In the Ohio State University outpatient department, it is almost routine to use a nasotracheal or nasopharyngeal tube for such cases. The nasopharyngeal tube is frequently used after the administration of thiopental sodium; however, it should be chosen carefully to fit the size of the nose and the length of the upper respiratory tract from the external nares to the epiglottis and should be inserted after enough time has elapsed for the nitrous oxide to produce an analgesic effect on the body. Otherwise, the nasopharyngeal tube may cause a laryngeal spasm.

Anesthetic agents used in connection with the nasopharyngeal or nasotracheal tube include lubricating agents to reduce friction and irritation and to produce analgesia of the mucous membrane. Satisfactory agents for this purpose are

Diothane or lidocaine (Xylocaine) ointment. These agents should be applied liberally to the surface of the tube prior to its insertion into the nares. They will lubricate the nares as the tube slides through and will produce topical anesthesia, which will reduce the stimulation during anesthesia.

Topical anesthetic sprays can be utilized to reduce gagging and coughing during anesthesia. The lower pharynx and larynx should never be anesthetized with a topical anesthetic unless an endotracheal tube is inserted. This type of topical anesthesia of the larynx inhibits the cough reflex in this region and permits aspiration of foreign material into the larynx. Spraying the upper pharynx, palate and nasal mucosa is permissible to reduce stimulation from the throat pack or nasopharyngeal tube.

CURARE AND SIMILAR DRUGS

Dentists who intend to use thiopental sodium must master also the use of the skeletal muscle relaxants which are of value during anesthesia and which are essential for laryngoscopy and oral intubation.

Curare • Curare was first used clinically by the medical profession for anesthesia in 1942. Curare and curarelike products are not poisonous to the body. As a matter of fact, curare has no known toxic effect on the body. Its pharmacological action and physiological effect are described in any modern textbook of physiology.[2] Curare and curarelike products produce relaxation of voluntary skeletal muscles only.

Curare can be administered intravenously to outpatients who are receiving general anesthesia. At the Ohio State University outpatient department curare has been administered to several hundred outpatients without any undesirable side effects. When a patient is under nitrous oxide-oxygen anesthesia of sufficient depth to permit completion of minor oral surgery and yet not deep enough to provide sufficient relaxation of the patient, 3 to 12 mg. of curare can be given intravenously to produce relaxation without deepening or prolonging anesthesia significantly. The onset of relaxation occurs within 30 seconds. Its maximum effect is produced within 1 to 3 minutes, and the resultant effect is completed within 15 minutes.

Respiratory paralysis, which may result from the use of curare, can be controlled by artificial inflation of the lungs and can be prevented by careful administration of the agent. There is a wide margin of safety between the dose necessary for the production of satisfactory relaxation and the dose necessary to produce respiratory paralysis. Six to 24 mg., 2 to 8 cc., of curare can be administered intravenously as an aid to endotracheal intubation.

The degree of relaxation depends on the size and the age of the patient, the depth of anesthesia, and the rapidity with which the drug is injected. Relaxation sufficient to permit laryngoscopy will last from 3 to 10 minutes, and the maximum effect will disappear in from 5 to 15 minutes. In cases requiring endotracheal intubation, ordinarily it is more satisfactory to maintain a slight degree of relaxation during light dental anesthesia by the use of curare.

Anectine • Among the many agents recently introduced for curarelike effects in anesthesia perhaps the only one worthy of mention for use in minor oral surgery is succinylcholine chloride (Anectine),[3] which is marketed for intravenous injection in 10 cc. rubber-stopped vials, with 10 mg. per cc. Anectine produces the

2. Best, C. H., and Taylor, N. B. The physiological basis of medical practice, ed. 5. Baltimore, Williams & Wilkins Co., 1950, p. 1081, 1082.

3. Dardel, O. von, and Theslefl, S. Clinical experience with succinyl-choline-iodide, a new muscular relaxant. Anesth. & Analg. 31:250 July-Aug. 1952.

same relaxation as curare. The average dose for visualization of the larynx with the MacIntosh blade on the laryngoscope is 20 mg. to 50 mg.

Onset of relaxation is approximately the same as that for curare, but recovery is extremely rapid with relaxation persisting approximately three or four minutes. This quick return of spontaneous respiration is of great advantage in maintaining normal physiology of the body during anesthesia. In those cases where prolonged relaxation is of no value, succinylcholine chloride is of definite advantage to produce a short period of relaxation for laryngoscopy or intubation. There are no apparent toxic effects from this drug, and the undesirable reactions caused by an overdose are minimized because of its short period of action on the body. It has a definite place in anesthesia for minor oral surgery in outpatient dental work.

There is no known antidote for succinylcholine chloride, but fortunately because of its short action there is little or no need for one. Curare has a longer action; when only a short period of anesthesia for minor oral surgery is necessary, it may be desirable to counteract the effect of curare as soon as the surgery is completed.

Curare Antagonists • Previously neostigmine (Prostigmine) was used as an antidote for curare. Neostigmine is a potent drug and has undesirable side reactions, such as profuse salivation, increased peristalsis and cramps. The dosage of neostigmine to overcome the effect of curare is 0.25 mg. administered intravenously every 30 seconds until the desired effect is reached or until a maximum of 2 to 3 mg. has been injected.

In the past year a new curare antagonist, Tensilon[4] (dimethylethyl ammonium chloride), has proved to be very satisfactory. It is available in 10 cc. rubber-capped vials with 10 mg. per cc. Clinical experience proves that it can be used more freely than neostigmine without producing undesirable side effects.

In my experience there have been no side effects from the use of Tensilon in dosage sufficient to obtain the desired result. The literature indicates, however, that bradycardia may occur after its use; if it does occur, it can be prevented or relieved by the use of the proper dosage of atropine.

The dosage of Tensilon administered intravenously is 1 cc. every 30 seconds until the desired effect is brought about. It usually acts in ½ to 1 minute, and its duration is approximately 10 minutes, depending on the dosage used. Maximum dosage used in the Ohio State University clinic has been 4 cc., injected in 2 minutes without any side effects.

Tensilon counteracts the action of curare but is not effective against succinylcholine chloride. It should be remembered that Tensilon acts to overcome the action of curare but does not destroy its effect. Therefore, in certain instances where large dosages of curare may have been used and Tensilon may have been administered soon after the curare, the effect of the Tensilon may wear off before that of the curare. If this should occur, curare will regain its effectiveness, and relaxation and possibly respiratory paralysis may return.

THIAMYLAL SODIUM

Another agent used intravenously to produce loss of consciousness is thiamylal sodium (Surital).[5,6] Its action is similar to that of thiopental sodium. Experience with this drug in the Ohio State University clinic indicates that it has no advantages over thiopental sodium and that it may be less desirable because its action is

4. Salter, W. T. Textbook of pharmacology. Philadelphia, W. B. Saunders Co., 1952, p. 866.

5. Dornette, W. H. L., and Tuohy, E. B. Clinical trial of surital sodium in 1200 cases of general anesthesia. Anesth. & Analg. 30:159 May-June 1951.

6. Phillips, Hayward S. Some clinical observations on the use of surital sodium in combination anesthesia. Anesth. & Analg. 32:56 Jan.-Feb. 1953.

more difficult to anticipate. There has been no difference in the incidence of laryngeal spasm with these two drugs. The use of thiamylal sodium seems to cause some slight, disagreeable emotional sensation postoperatively.

PENTOBARBITAL SODIUM AND SECOBARBITAL SODIUM

Recently in dental anesthesia the use of pentobarbital sodium (Nembutal) and secobarbital sodium (Seconal) administered intravenously has been more widely accepted. These agents have certain distinct advantages over thiopental sodium or thiamylal sodium. Solutions of these drugs can be purchased and kept in the dental office over long periods of time without deterioration. It appears that there is no increased incidence of laryngeal spasm following the use of pentobarbital sodium or secobarbital sodium administered intravenously. This factor is of distinct value to the dental anesthetist who is not prepared to perform a laryngoscopy and intubation.

The disadvantages in the intravenous use of either of these drugs as compared to the use of thiopental sodium are that their effect is more prolonged, the recovery from anesthesia is prolonged, and the period of recovery in the dental office is longer. Dosage for induction of anesthesia is 3 cc. to 7 cc. (150 mg. to 350 mg.), given intravenously.

TRICHLOROETHYLENE

New agents used for inhalation anesthesia in dentistry include trichloroethylene,[7, 8] which is marketed under several trade names in this country. Trichloroethylene has been used extensively for anesthesia and analgesia in England for the past 25 years and has gradually been introduced into this country from Canada since about 1947. Trichloroethylene is a colorless, clear liquid with a mild, pleasant odor and a boiling range of 86° C. It is not explosive but may be inflammable when mixed with oxygen under certain conditions. Under ordinary conditions for anesthetic uses, it will not decompose nor be inflammable.

It cannot be used successfully for induction of anesthesia by itself but is very satisfactory as an adjunct with nitrous oxide and oxygen for induction and maintenance of anesthesia. It is relatively less volatile than vinyl ether (Vinethene) and therefore less expensive for routine use. Recovery from anesthesia is slower than recovery from anesthesia with vinyl ether or nitrous oxide, and relatively less mucus and saliva are produced.

Trichloroethylene will decompose if subjected to high temperature or if administered through an anesthetic machine system so that it comes into contact with soda lime. In both instances the decomposition will result in the formation of toxic vapors, including phosgene.

Trichloroethylene, like chloroform, ethyl chloride or cyclopropane, has a toxic effect on the heart. For this reason, whenever the anesthetist is using trichloroethylne, he should keep constant and vigilant watch on the pulse of the patient to note any changes in the rhythm or volume of the pulse. Clinical experience with trichloroethylene in combination with nitrous oxide and oxygen has shown that the patients experience the same extremes of sensitivity as with other drugs. For instance, forcing trichloroethylene in heavy concentration into the anesthetic mixture over long periods of time will show no changes in the pulse of some patients; but in other patients bradycardia will occur with low concentration after short periods of usage, and extrasystoles as well as irregularities and changes in the volume of the pulse also will occur.

7. Clinical reports on the use of trichloroethylene anesthesia and analgesia. Madison, Wis., Ohio Chemical and Surgical Equipment Co.

8. Brittain, G. J. C. Trichlorethylene (trilene) as an anesthetic in neurosurgery. Anesth. & Analg. 27:145 May-June 1948.

In one case, that of a negro woman, aged 56, height 5 feet 2 inches, weight 160 pounds, 7½ grains of thiopental sodium was used for induction. Trichloroethylene was added to nitrous oxide in a proportion of 80:20 after one minute of anesthesia. The vaporizer on the machine for trichloroethylene was set at no. 1 for the second minute of anesthesia and was increased to no. 2 for the third minute of anesthesia.

At the end of three minutes of anesthesia—two minutes of trichloroethylene—there was a striking irregularity in the pulse. Administration of trichloroethylene was stopped immediately, the patient was placed on semi-open anesthesia, that is, inhalation anesthesia with partial rebreathing; and vinyl ether was substituted for trichloroethylene. After administration of nitrous oxide and oxygen with vinyl ether for one minute, all irregularities of the pulse disappeared. This case demonstrates that constant attention must be given by the anesthetist to the patient during the administration of trichloroethylene.

The clinical use of trichloroethylene in conjunction with nitrous oxide and oxygen for dental anesthesia for a period of three years has led to the following conclusions:

Trichloroethylene is a satisfactory agent for use in combination with nitrous oxide and oxygen for dental operations.

Constant attention must be given by the anesthetist to the patient's pulse during the administration of trichloroethylene.

Trichloroethylene should take its place among agents used for general anesthesia in dentistry but should not replace other agents where they are indicated.

Advantages of trichloroethylene are that it is inexpensive, it is not explosive, it is a potent agent, and it is relatively stable.

Disadvantages of trichloroethylene are that it is toxic to the heart, it cannot be used with soda lime, and induction and recovery are slower than with nitrous oxide or vinyl ether.

Trichloroethylene may cause tachypnea and confusing respiratory signs for depth of anesthesia.

VINYL ETHER

Vinyl ether should not be considered a new anesthetic agent, although it has not been widely accepted by the average dentist using general anesthesia. It is a relatively safe and extremely potent anesthetic agent. It can be used in the dental office for anesthesia if the anesthetist has a method of administering oxygen under pressure and an aspirating machine for use in an emergency.

Vinyl ether has a mildly unpleasant odor. It causes an increase in salivation. Therefore, premedication with atropine may be advantageous. Pupillary reflexes and respiratory signs of anesthesia are the same as those for ether and nitrous oxide. Eyeball reflexes, however, do not correspond to those caused by any other inhalation agent. The patient may be in the third plane, third stage anesthesia, and yet the eyeballs may rotate.

Induction with vinyl ether is very rapid. When the open drop method is used, most children will pass through the analgesic and delirium stages after approximately six inhalations of vinyl ether. Recovery from vinyl ether anesthesia is very rapid, and the incidence of nausea is low. Vinyl ether is extremely explosive, especially in combination with oxygen. No cautery or open flame should be in use when vinyl ether is administered. Static sparks from the operator, anesthetist or the equipment may cause an explosion. Even sparks caused by two instruments striking each other are sources of danger.

Vinyl ether can be used safely in the modern dental or oral surgery office where air conditioning is maintained so that control of temperature and humidity is possible and there is free circulation of

air. Vinyl ether has a wide margin of anesthetic safety. It has a beneficial effect on the heart and often will improve the conduction mechanism in case of arrhythmias. It is a respiratory stimulant. For a patient with cardiac disease it is a satisfactory agent when used in combination with nitrous oxide.

Prolonged administration of vinyl ether has caused liver necrosis, so it should not be given to patients with liver disease. This effect is not a contraindication for its use with healthy patients if the duration of anesthesia is short—not more than 45 minutes—or if the concentration of vinyl ether is kept low by use in combination with nitrous oxide and oxygen. Vinyl ether should not be used for prolonged anesthesia in diabetic patients.

Vinyl ether, as most other anesthetic agents and ether in particular, causes hyperglycemia, probably because of increased glycogenolysis of the liver or possibly through an inhibition of the action of insulin.[9] It is probably associated also with stimulation of the sympathetic nerve supply to the liver as a result of changes in secretion of epinephrine. Such changes in blood sugar levels may deplete insulin reserves of the diabetic patient and result in serious physiologic changes in metabolism.[10] The resultant acidosis and ketone production may cause coma.

Vinyl ether is well adapted for combination with nitrous oxide and oxygen. Most dental anesthetic machines are or may be equipped with an attachment for vinyl ether. The advantage of combining vinyl ether with nitrous oxide and oxygen is that a high percentage of oxygen may be used to produce third stage, third plane anesthesia.

Vinyl ether is relatively expensive and is extremely volatile. It can be conserved by combining it with nitrous oxide and oxygen and using rebreathing through the machine. This procedure eliminates the loss of vinyl ether, which escapes to the air when it is used with the open drop technic. When vinyl ether, nitrous oxide and oxygen are used as a combined anesthetic, rebreathing should be used (1) to conserve anesthetic agents, (2) to prevent vinyl ether vapor from filling the atmosphere in the region of operation and causing an explosion hazard and (3) to improve or help regulate the respiration by the use of carbon dioxide formed by the patient.

9 Buttles Avenue

9. Goodman, Louis, and Gilman, Alfred. The pharmacological basis of therapeutics. New York, Macmillan Co., 1941, p. 64.

10. Best, C. H., and Taylor, N. B. The physiologic basis of medical practice, ed. 5. Baltimore, Williams & Wilkins Co., 1950, p. 663.

The Occupation of Life • Life is occupied in both perpetuating itself and in surpassing itself; if all it does is maintain itself, then living is only not dying, and human existence is indistinguishable from an absurd vegetation. *Simone de Beauvoir, "The Ethics of Ambiguity."*

The effect of high speed burs, diamond instruments and air abrasive in cutting tooth tissue

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There have been numerous developments and improvements during recent years in the methods of cutting cavities for restorations. The introduction of carbide burs and diamond instruments to supplement and replace steel burs and carborundum stones has extended the possibilities of use of rotating instruments. The air abrasive unit has made possible an entirely new method of cutting cavities. The carbide burs and diamond instruments allow increased operating speeds for these rotating instruments. For many years the conventional operating speeds have ranged from 2,500 to 6,000 rpm. Recently technics have been developed in which rotating speeds of approximately 12,000 to 20,000 rpm have been used and the results have been studied. The use of increased operating speeds has necessitated the improvement and refinement of dental handpieces. Likewise, it has been necessary to modify the dental engine so as to supply a motor with greater operating speeds and to develop more reliable belt and pulley systems for driving the handpiece. Adequate lubrication is essential when high-speed operations are employed.

The increase in rotational speed of the handpiece has been accomplished by a variety of methods. Entirely new motor units now are available which operate at increased speeds, or the older motors may be used at a lower speed of rotation with a larger pulley system or a combination of pulleys. With some units it is possible to change the electrical resistance to the motor and thereby alter the speed of rotation. The latter method may be relatively inexpensive, and various equipment manufacturers have been able to advise the profession on the desirability of such alterations. Several of the newer units are equipped to supply either the conventional low-speed range of operation or a variation in high-speed ranges.

These improvements and refinements in facilities have led to certain possibilities of change in operation when rotating instruments are used. Primarily, they have led to a change in the choice of instrument employed, as well as a change in the rate of tissue removal and in care of the equipment. There is no change, however, in the basic necessity of observing the most favorable physiological principles during the cutting operation.

Technics are being studied which are designed to give a maximum of efficiency

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of operation, combined with a minimum of damage to the tissue as well as a minimum of discomfort to the patient and with a minimum of fatigue for the operator. Numerous variables are involved in such technics. These variables need to be studied in detail, and subsequently they must be controlled.

At least four major physical factors are involved in the use of cutting instruments for tooth tissue. The first factor is the heat generated during the cutting operation. This should be studied with respect to the temperature developed in the tooth and that developed in the cutting instrument. The production of heat in the tooth may be a source of damage to the remaining tooth tissue as well as of discomfort to the patient. The heat developed in the cutting instrument undoubtedly has some influence on the life and effectiveness of the rotating instrument. The second physical factor is the vibration which develops during the cutting operation. Knowledge regarding both the vibration in the handpiece and that transmitted from the cutting instrument to the tooth is important. The vibration developed during the cutting operation may cause apprehensiveness on the part of the patient if not actual discomfort. For the operator, the vibration may be a source of annoyance and fatigue during the operation.

A third factor is the relative effectiveness or efficiency of various cutting instruments. The design of the instrument and the material of which it is constructed are significant in determining its effectiveness as a cutting instrument. The fourth factor is related to the life of the instrument. The effective operating life of a rotating instrument is to a large degree controlled by the material of which it is made as well as by the basic design of the instrument.

Each of the four factors listed is influenced by (1) the speed of operation, (2) the pressure or force applied to the cutting instrument, (3) the choice or lack of various coolants applied to the region being cut and (4) the general care of the handpiece and instrument employed. The proper choice of handpiece and cutting instrument for the speed range desired must be considered as well as adequate lubrication, proper maintenance, and sterilization throughout the serviceable life of the instrument. Because of the many variables involved, therefore, the problem is one of considerable magnitude. Also it is essential that a practical operating technic be maintained.

Table 1 • Temperature rise during cutting of tooth tissue

Procedure	Steel bur	Speed of rotation rpm	Force applied lbs.	Temp. rise in tooth degrees F.
Cutting enamel and dentin	No. 37	2,350	2-2½	67.2
	No. 557	2,350	2-2½	76.0
Cutting enamel	No. 37	3,400	2-2½	100.2
	No. 557	3,400	2-2½	95.3
Cutting dentin	No. 37	3,400	1-1½	38.3

TEMPERATURE RISES DURING CUTTING

The temperature developed in the tooth as a result of cutting the enamel and dentin may be one of the chief sources of discomfort to the patient and damage to the remaining tooth tissue. The choice of cutting instrument, speed of rotation developed during the cutting operation, and the use of either air or water as a coolant are factors which control the temperature rise during the cutting operation.

Table 1 shows the typical temperature rise (Fahrenheit) which may be expected when enamel and dentin are cut with two different types of steel burs. Relatively slow speeds of operation (less than 5,000 rpm) were used, but a force of more than two pounds was applied to the handpiece when cutting enamel. Intermittent cutting of the tooth structure was em-

Table 2 • Temperatures (°F.) developed with no. 557 steel bur after change in speed and pressure (no coolant)

Speed of rotation rpm	Force applied			
	0.5 lb.	1.0 lb.	1.5 lb.	2.0 lb.
2,000	30°	40°	50°	60°
4,000	38°	59°	78°	100°
6,000	43°	75°	95°	125°
8,000	48°	88°	110°	—
10,000	52°	102°	121°	—

ployed; a two second cut was followed by a one second rest period. The temperatures recorded represent the increase in temperature in the tooth as observed when the thermocouple was inserted into the tooth and when it subsequently was exposed in the cutting operation. No coolant was applied during the cutting process. It can be seen that a significant temperature rise occurs in the tooth when cutting either enamel alone or enamel and dentin simultaneously. The two pounds or more is an excessively heavy pressure but it may be necessary in order to remove the tissue effectively. A significantly lower temperature rise occurred when dentin was cut as compared with the rise when enamel was cut. This may be due, in part, to the lesser amount of force applied to the handpiece; it also may be due to a great degree to the fact that dentin is less difficult to cut than enamel. When a temperature rise approaching 100° F. is obtained in close proximity to the pulp, the chances are great discomfort will be experienced, and at least temporary damage to the tooth tissue may result. Precautions should be taken to avoid the development of excessive temperatures in the tooth.

Table 2 shows the effect of variations in speed of operation and amount of force applied to the cutting instrument and the influence these variations have on the temperature developed in the tooth during the cutting process. An examination of the values in Table 2 reveals that a slight increase in force applied to the cutting instrument may cause a greater degree of temperature rise than a corresponding increase in rotational speed. Because of the discomfort and injury produced when hot beverages or foods are taken into the mouth, it is believed that soft tissue will not tolerate readily a temperature rise of more than 30 to 40° F. without displaying a significant response. From the values indicated in Table 2 it would seem that a force of one pound or less applied to the rotating instrument would be most appropriate; and when using a light force of a half pound, a speed up to 6,000 rpm might well be employed without damage to the pulp. This is in keeping with the practice of many operators and clinicians who have advocated the use of no coolant, but rather a slow operating speed and a light force on the handpiece. Such a practice is conservative and little resulting damage would be anticipated.

Table 3 shows typical temperatures that may be expected when cutting tooth tissue at a fixed load of one pound, at different speeds of rotation. Also the influence of different coolants on the temperature rise occurring in the tooth is shown. Three types of rotating instruments were studied at the various speeds of rotation. These values for temperature rise are typical for the various conditions

Table 3 • Temperature rise (°F.) in tooth when 1 lb load was applied to handpiece

Type instrument	Coolant	Speed of rotation (rpm)				
		2,000	4,000	6,000	8,000	10,000
No. 557 Steel	None	42°	64°	78°	92°	105°
	Air	15°	22°	30°	36°	40°
	Water spray	6°	7°	9°	10°	11°
No. 557 Tungsten carbide	None	32°	45°	59°	71°	80°
	Air	12°	17°	19°	22°	23°
	Water spray	4°	5°	8°	10°	11°
No. 701 Diamond	None	21°	30°	39°	46°	52°
	Air	9°	14°	18°	22°	24°
	Water spray	2°	4°	7°	8°	9°

employed. It can be seen that no excessively high temperatures resulted under any of the operating conditions tested when the low speed of 2,000 rpm was used.

At 4,000 rpm only the steel bur, with no coolant employed, caused an unnecessarily high temperature rise. At 6,000 rpm, when no coolant was employed, both the steel and carbide bur caused excessive temperatures, and at 8,000 rpm or above, with no coolant, all three types of instruments produced excessive temperatures. It can be seen also that both air and the water spray are effective coolants during the cutting operation, but the water spray is more effective than air alone. When air or water spray is applied, under the conditions of these experiments, it is thought that speeds of 10,000 rpm will not produce excessive temperatures in the tooth. Numerous devices are available to the profession to apply either air or water during the cutting operation, or it is possible to apply these coolants manually from a syringe or other device. When speeds of over 5,000 or 6,000 rpm are employed with the rotating instrument, a coolant is essential.

Table 4 shows the results obtained when using a lighter load with a no. 37 diamond inverted cone type instrument, with variations in operating speeds from 2,500 to 15,000 rpm. Again, the water spray is effective in lowering the temperature in the region being cut, whereas an excessive temperature develops if no coolant is applied.

Since the introduction of the carbide bur and the diamond instrument, considerable interest has centered on the use of operating speeds above 10,000 rpm. With both carbide and diamond rotating instruments, the removal of tissue is greater at increased speeds than at low speeds of operation. Likewise, it has been observed that, because of the increased effectiveness of the instruments at high speeds, it is no longer necessary to apply excess force to the cutting instrument; because of the ease with which the instrument cuts, a force of less than a half pound is effective.

Table 4 • Temperature rise (°F.) in tooth when 0.5 lb. load was applied to handpiece

Type instrument	Coolant	Speed of rotation (rpm)			
		2,500	5,000	10,000	15,000
No. 37 Diamond	None	15-20°	30-35°	65-70°	105-110°
	Air	10-15°	25-30°	50-55°	75- 80°
	Water spray	0- 5°	5-10°	5-10°	10- 15°

When an air abrasive unit is employed to cut tooth tissue, there is relatively little temperature change in the tooth. There may be a temperature rise of as much as 4 or 5° F. in the tooth in the immediate area of cutting, depending on how the instrument is used and the control of the abrasive material. Under other conditions of operation there may be a cooling action, with a drop in temperature of as much as 3 to 5° F. These temperature changes are small in comparison to the temperature changes when the cutting is done with rotating instruments. It is not certain whether this small degree of temperature change is sufficient to cause discomfort to the patient, but it should not be sufficient to cause a pathologic change to occur in the tooth. The low degree of temperature change experienced is definitely a favorable quality of the air abrasive unit.

VIBRATION DURING CUTTING

From the standpoint of apprehension of the patient and fatigue of the operator, perhaps one of the most disturbing factors is the vibration that is experienced during the cutting of tooth structure. Often this vibration is experienced as sound which is transmitted by the bone structure to the hearing mechanism. In extreme cases, the sound of the rotating mechanism as distinct from the cutting operation is sufficient to cause apprehension on the part of the patient. The com-

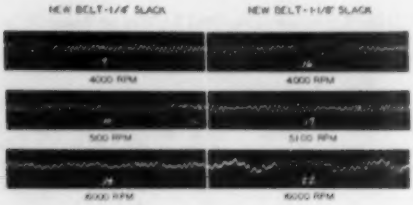

Fig. 1 • Vibration patterns developed from properly adjusted and loose engine belts

bination of the apprehension of the patient and the vibration set up in the handpiece may be a source of fatigue for the operator. For these reasons the vibration in the cutting mechanism should be at a minimum, although sufficient data have not been reported to indicate the degree of real discomfort experienced by the patient as a result of vibration.

Studies have been reported which indicate that the fundamental vibration wave is determined by the speed of rotation of the handpiece shaft, and that it changes with operating speed and pressure.[1] The amplitude or intensity of the fundamental vibration is decreased as the operating speed is increased. The frequency of vibration is increased as the speed is increased. It has been observed also that slow speeds of operation and light pressures on the handpiece give relatively larger amplitude of vibration. It will be recalled, however, that so far as the heat generation during the cutting operation is concerned, there is an increase in the generation of heat with increased speed of operation and excessive pressures applied during the cutting operation.

Although some of the vibration is related to the handpiece shaft, as noted earlier, a large percentage of the vibration experienced in the handpiece is generated by the conventional belt and pulley system of the dental motor.[2] The vibration pattern produced by this combination of belt, pulley and handpiece is modified both by the speed of operation and the condition of adjustment in the mechanical parts. The addition of a conventional contra-angle to the straight handpiece adds significantly to the vibration which develops in the handpiece unit when operated under conventional conditions.

From Figure 1 it can be seen that the tightness of the belt influences the vibration pattern experienced in the dental handpiece. Not only is a correct adjustment necessary to give a most effective drive to the handpiece, but also to control the vibration pattern. The waves recorded in the left portion of Figure 1 indicate the vibration developed at three different speeds of operation when the belt is adjusted with a small amount of slack while being driven at speeds up to 16,000 rpm. On the right side (Fig. 1) are shown vibration patterns developed when a very loose belt is used. The vibration pattern is more extreme with a loose belt than with one which is properly adjusted. These wave patterns represent the pattern developed on an oscillograph screen and are recorded from a magnetic pickup placed on the handpiece during operation.

Examination of the right hand portion of Figure 1 reveals a variation in vibration amplitude which is most obvious at the lower speeds. Visual inspection of the belt system during the test revealed that the vibration wave as recorded followed closely the vibration pattern observed in the belt.

In Figure 2 is shown the correlation which exists between the vibration pattern observed in the dental handpiece and that experienced in the tooth. Figure 2 shows curves developed from three different handpieces used to cut tooth tissue with three different types of burs.

1. Henry, E. E., and Peyton, F. A. Vibration characteristics of the rotating dental instrument. J. D. Res. 29:601 Oct. 1950.

2. Peyton, F. A., and Henry, E. E. Problems of cavity preparation with modern instruments. New York J. Den. 22:147 April 1952.

The curves represent the relative percentage vibration amplitude as a vertical component and the frequency in cycles per second as the horizontal component. It becomes apparent from these curves that each of the three different handpieces, when operated clinically, produces a different amplitude pattern of vibration. This is thought to be associated with the degree of adjustment in the individual handpiece. The vibration pattern picked up from the handpiece, as indicated by the dotted line, is similar to the vibration pattern of the tooth being cut by the same handpiece and bur. From this it may be concluded that the vibrations produced in the dental handpiece are transmitted directly to the tooth and are experienced by the patient. Further work is being carried on to determine the significance of operating speed and pressure on the vibration pattern experienced by the patient. The chief value of the curves shown in Figure 2 is to indicate the close correlation between vibration characteristics in the dental handpiece and those experienced in a tooth being cut in the mouth.

From a practical standpoint it is considered that there is no significant vibration produced when the air abrasive is used as a means of cutting tooth structure. There is no actual contact between the nozzle of the air abrasive unit handpiece and the tooth, so that any vibration existing in the mechanism is not transmitted to the tooth. The only possible vibrations are those that result from the impact of small abrasive particles on the tooth structure. Observations have been reported which indicate that possibly a slight impact type of vibration may occur from some of the air abrasive particles as they strike the tooth.[1] These vibrations have been recorded, and it has been noted that the relative value of the vibration produced by the air abrasive unit in comparison with that of the rotating instrument is of little practical significance.

RELATIVE EFFICIENCY OF CUTTING INSTRUMENTS

Studies have been reported which describe the relative efficiency of various cutting instruments when cutting a material that simulates dentin in hardness, and also when cutting a hard substance like glass which simulates the structure of enamel. These studies have revealed that steel and tungsten carbide burs cut at essentially the same rate when operated under comparable conditions in soft materials.[3] The carbide burs retain their cutting edge for a longer time than steel burs, but are more susceptible to fracture because of the brittle nature of the material. This is thought to be a normal difference between burs made from these two materials since the design of the two burs is essentially the same. The steel bur, being made of a ductile material, will tend to dull because the blade edges will turn, while the carbide material, be-

3. Peyton, F. A. Temperature rise and cutting efficiency of rotating instruments. New York D. J. 18:439 Nov. 1952.

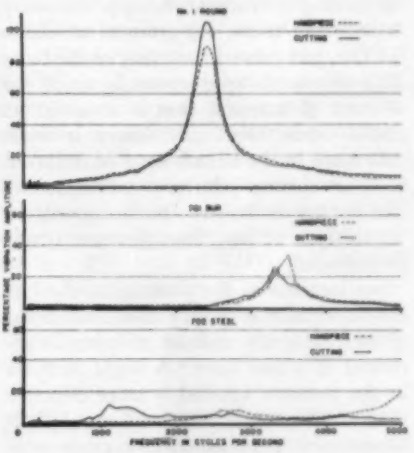

Fig. 2 • Percentage vibration amplitude of handpieces and burs at various frequencies

ing brittle, will tend to fracture and thus fail to cut.

The no. 37 inverted cone type of bur is approximately five times as effective in removing material as is the no. 557 fissure type bur, when operated under similar conditions of speed and applied load.[4] From measurements that have been made it is apparent that the no. 37 inverted cone type of bur is one of the most effective in cutting material which has physical characteristics comparable to dentin.

In Figure 3 is seen the comparative effectiveness of different no. 37 type dental burs in removing Ivorine material under a constant pressure of 200 Gm. at varying speeds of rotation. Speeds up to approximately 20,000 rpm have been used in these studies. It should be kept in mind that the normal maximum operating range for most equipment in common use is approximately 5,000 rpm.

It can be seen from these curves that several of the burs exhibit a uniform increase in the amount of material removed with an increase in operating speed when a constant pressure is applied. A pressure of 200 Gm. on the handpiece represents approximately seven ounces applied to the cutting instrument. At approximately 20,000 rpm there is a removal of about 0.4 Gm. per minute for many of the burs. This represents approximately twice the amount of material that is removed at 10,000 rpm. Obviously, there is some difference in the effectiveness of different burs in cutting relatively soft material like dentin or Ivorine, but at speeds of 10,000 rpm or less, the difference is not pronounced.

An increase in the pressure applied to the handpiece is a very effective means of increasing the amount of material removed in a unit time.[4] A slight increase in the pressure applied is more effective than an increase in rotational speed. This observation is similar to that made relative to the temperature rise during the cutting operation on the tooth. Probably a close correlation exists between the amount of material removed and the heat developed during the cutting operation, and if an increase in pressure is effective in removing material it will also be effective in increasing the temperature during the cutting process.

It has been observed clinically that the normal reaction of an operator to an increase in speed of operation for any given instrument is to use a lighter pressure on the handpiece. This might be deduced to some extent from Figure 3. When the extremely light pressure of 200 Gm. is applied with a speed of 20,000 rpm, the instrument is more than four times as effective in removing tooth tissue as it would be at a conventional speed of approximately 5,000 rpm. Because of this increased effectiveness in removing material, it is a normal reaction to use a lighter pressure during the cutting operation.

Figure 4 shows the relative effectiveness of the no. 557 steel burs in removing soft material like Ivorine at a 200 Gm. pressure and at different speeds of operation. Obviously, there is somewhat greater variation between different no. 557 burs in their ability to remove material than was observed in no. 37 burs. A comparison of the values shown in Figure 3 for the no. 37 steel bur with those in Figure 4 shows that a smaller amount of material is removed per unit time with the no. 557 bur than with the no. 37 bur. This again emphasizes the effectiveness of the no. 37 steel bur as a cutting instrument. Comparison of values in Figures 3 and 4 indicates that the average no. 557 bur will remove approximately 0.1 Gm. of material per minute, while the no. 37 bur will remove approximately 0.4 Gm. of material at the same speed and pressure of operation.

Very little has been reported on the

4. Henry, E. E., and Peyton, F. A. A study of the cutting efficiency of dental burs for the straight handpiece. J. D. Res. 30:854 Dec. 1951.

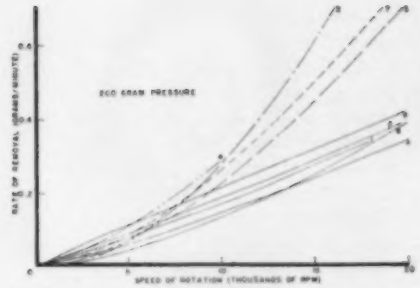

Fig. 3 • Rate of removal of Ivorine by no. 37 dental bur

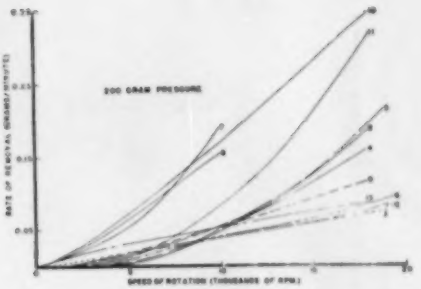

Fig. 4 • Rate of removal of Ivorine by no. 557 dental bur

effectiveness of the air abrasive unit in removing tooth material. In general, it has been observed that such a unit is at least as effective as a rotating instrument in cutting tooth tissue. One study[5] has been reported which indicates that the air abrasive unit, operated under normal conditions, will remove as much tooth enamel in a 30 second period of operation as will a diamond disk operated at 6,000 rpm when a force of 3 ounces is applied.

INSTRUMENT LIFE

Relatively little has been reported in the literature regarding the comparative characteristics which determine the life of different rotating cutting instruments. Studies of a clinical nature have shown that the life of carbide burs and diamond instruments is greater than that of steel burs and carborundum stones. The relative difference in these instruments, however, has not been well established.

In certain respects, the cutting efficiency and instrument life are closely related. Probably they do not represent the same property, however, since the basic effectiveness or efficiency is to a great degree dependent on the design and nature of the material from which the cutting instrument is constructed. The relative life of the instrument indicates the period over which the instrument will effectively remove tooth material. This quality also varies to some degree with the basic design and composition of the cutting instrument, but represents more specifically the characteristic of resistance to dulling. It is recognized, however, that a bur which is readily dulled during the operation is also not an effective instrument in removing tooth structure.

Some burs may not be effective in removing material either when first used or after a period of service, but at the same time they do not readily develop a dullness during the period of operation.[6] Other burs may have a high initial rate of tissue removal, but by the end of a very short interval of time they are less effective in removing material than initially, or perhaps less effective than another type or make of dental bur.

Figure 5 shows the results obtained when operating several different burs of the no. 557 type at 4,000 and 16,000 rpm with a pressure of 200 Gm. These curves are typical of results to be expected when operating at these speeds. A total

5. Black, R. B. Airbrasive: some fundamentals. J.A.D.A. 41:701 Dec. 1950.

6. Henry, E. E., and Peyton, F. A. The relationship between design and cutting efficiency of dental burs. Presented before the International Association for Dental Research, Philadelphia, March 1953.

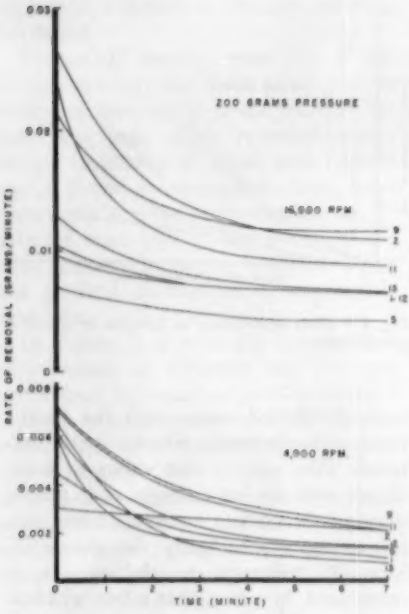

Fig. 5 • Rate of removal of brass by no. 557 dental bur

cutting time of seven minutes was studied for these different burs, and the amount of material removed in grams per minute is indicated as the vertical component of this graph. Since brass was the material which was being cut it can be expected that there is some dulling of the bur during the cutting operation. It would be desirable to replace brass with tooth tissue as the material cut, but because of the lack of uniformity of tooth structure and the change in weight which results from a drying action it is more desirable to use a uniform material of hard texture such as brass for comparative studies.

The curves in Figure 5 indicate that many of the burs of the no. 557 type have lost much of their effectiveness after an operating period of three minutes. Beyond that time there is some further loss of effectiveness, but most burs are considerably less effective after three minutes. The relative difference between different products can be seen by examining the curves for bur 5 operated at 16,000 rpm and bur 11 operated under the same conditions. After a seven minute interval the bur 11 is still more effective than bur 5 was initially. Relatively there is a much greater change in the effectiveness of bur 11 during the first few minutes of operation than in bur 5. It can be seen from these curves, also, that any of the burs are much more effective in removing material when operated at high speeds of rotation than when operated at lower speeds. Actually, the amount of material removed at 16,000 rpm during any given time interval, for example, five minutes, is approximately four times the amount of material removed at 4,000 rpm during the same interval.

The curves represented in Figure 6 illustrate the relative life of the no. 37

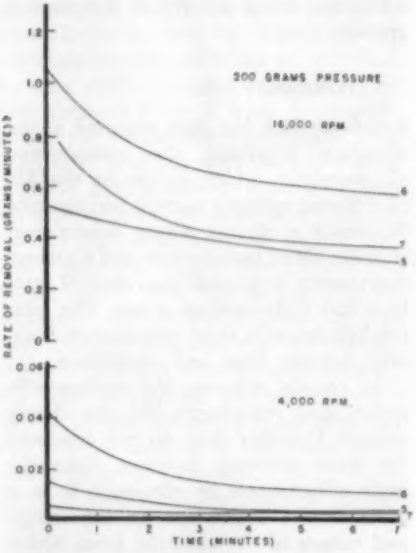

Fig. 6 • Rate of removal of brass by no. 37 dental bur

type of dental bur when operated under conditions similar to those described for no. 557 bur (Fig. 5). A comparison of the results reveals that the no. 37 bur is much more effective in removing material than is the no. 557 type of bur. This was observed also when the bur was used to cut softer material. From these curves it is also seen that the no. 37 bur tends to dull at a rate comparable to that for the no. 557.

Studies of a comparison of steel burs with carbide burs of the same design have been reported which indicate that the carbide burs also dull when being used to cut hard substances.[6] The rate of dulling, however, is significantly less with the carbide than with the steel bur although the initial rate of cutting may be quite comparable. While the most effective life of the steel bur is thought to be somewhat less than five minutes when cutting hard material, the carbide bur may still be effective at the end of 10 to 15 minutes when operated under the same conditions to cut the same material. A considerable variation exists between different brands of carbide burs, and no doubt there will be continued improvement in this type of rotating instrument.

Some studies are being made to compare the relative behavior of rotating diamonds and carbide burs when cutting hard substances. A comparison of the results obtained from a no. 701 diamond instrument and a carbide bur operated at 10,000 rpm, using a pressure of 200 Gm., are typical of results that might be expected. At the end of three minutes the carbide bur had removed 0.0030 Gm. of material. A no. 701 diamond instrument, however, removed only 0.0005 Gm. of material in the three minute interval, and was seriously damaged by dulling at the end of a four minute period of operation. Further studies are being carried on to determine the relative behavior of diamond and carbide instruments.

SUMMARY

The temperature rise which develops in the tooth, the vibration experienced by the patient and the operator, the effectiveness and life of the cutting instrument are all modified by the conditions present during the cutting operation. Some of the variables involved in the process include the properties of the cutting instrument, the speed of rotation, the force applied to the instrument, and the application of coolants to the surface being cut. A study has been made of the effects of high-speed operations with dental burs and diamonds as compared to the characteristics observed when they are operated at slower speeds.

Safe and effective technics using relatively high speeds of rotation are possible and practical for shaping cavities for restorations. No doubt further variations in technic of operation, combined with additional refinements and improvements in cutting instruments, will continue to be presented to the profession for evaluation, in an effort to establish the optimum condition of operation.

To Endure • Nothing endures unless it is of use in the world and in the economy of nature. *C. H. Mayo, "Medical Service in the United States Army," St. Paul Medical Journal 19:351, 1917.*

Effect of moisture contamination on the compressive strength of amalgam

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The deleterious effect of contaminating amalgam with moisture is well known.[1, 2, 3] In the presence of mercury, the zinc used in various concentrations in most commercial alloys dissociates water into hydrogen and oxygen. The trapped gas exerts a pressure within the restoration, which results in a delayed expansion of several hundred microns. The clinical manifestations of this expansion are protrusion, pitting and blisters, postoperative pain and internal corrosion.[2, 4] Clinical studies have indicated that this phenomenon accounts for approximately 16 per cent of all amalgam failures.[4] The relationship of zinc to this mechanism has been established definitely and has led to the introduction of nonzinc alloys in an attempt to minimize the harmful effects of such contamination.

Recognizing the magnitude of this reaction and the possible creation of extensive internal voids within the restoration, the authors concluded that the compressive strength of the restoration might be lowered by the corrosion products formed between oxygen and the components of the amalgam. The purpose of this study therefore was to measure the effect of moisture contamination on the strength of both zinc and nonzinc alloys.

PROCEDURE

Two commonly used commercial alloys, purchased on the open market, were employed. One alloy contained 1.6 per cent zinc and the other no zinc. Alloy of the same batch number was used in the preparation of all specimens. An alloy-mercury ratio of 5:7 was used for the nonzinc alloy and 5:8 for the zinc alloy. All trituration was carried out by means of a mechanical amalgamator.

Two series of specimens were prepared for each alloy. In one group, the amalgam was not touched by hand throughout the mixing and condensation procedure. In the second series, after trituration the mix was mulled for 30 seconds in the palm of the hand with three drops of normal saline solution. The mulling time was arbitrarily selected. Other than this one variable, all specimens in the two groups were handled in exactly the same manner.

Since it is difficult, if not impossible, to control accurately the packing thrust and

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‡Now at Dental School, University of Medical Sciences, Thailand.

1. Crowell, W. S., and Angell, R. C. Unpublished data. Philadelphia, The S. S. White Dental Mfg. Co., 1936.

2. Schoonover, I. C.; Souder, Wilmer, and Beall, J. R. Excessive expansion of dental amalgam. J.A.D.A. 29:1825 Oct. 1942.

3. Research Commission Report. Excessive expansion of amalgam. J.A.D.A. 29:292 Feb. 1942.

4. Healey, H. J. and Phillips, R. W. A clinical study of amalgam failures. J. D. Res. 28:439 Oct. 1949.

the amount of work done on the alloy either by hand or mechanical condensation, all specimens were prepared by means of an automatic packing device. No mercury was expressed after trituration; the entire mix was placed immediately in the mold, and a static load of 4,000 pounds per square inch was applied for two minutes. The specimen, 10 mm. by 5 mm., was trimmed smooth with a razor blade and removed from the mold. Specimens were stored at room temperature until tested. A Tinuis Olsen machine was used for determining the compressive strength, the load being applied at the rate of 650 pounds per minute. Compressive strengths were measured starting at one hour and then at intervals up to one year. A minimum of six specimens were run for each series at each time interval. Mean values were used.

Table • Age and strength, in pounds per square inch, of control and contaminated zinc and nonzinc alloys

Age of specimen	Zinc alloy		Nonzinc alloy	
	Control	Contaminated	Control	Contaminated
1 hour	12,700	12,700	15,400	17,300
4 hours	25,800	29,000	39,800	40,000
8 hours	39,700	39,990	38,500	39,900
18 hours	43,900	45,300	44,700	43,900
24 hours	48,500	46,700	45,100	45,300
72 hours	47,800	45,100	45,500	46,000
168 hours	48,200	46,400	45,600	45,900
336 hours	48,200	46,700	48,400	47,200
1 month	48,300	38,100	50,900	47,000
2 months	50,500	36,200	49,000	49,600
3 months	51,200	39,900	50,200	49,800
4 months	51,000	38,000	53,300	52,500
6 months	52,300	41,400	54,600	51,700
12 months	51,600	39,300	53,200	50,900

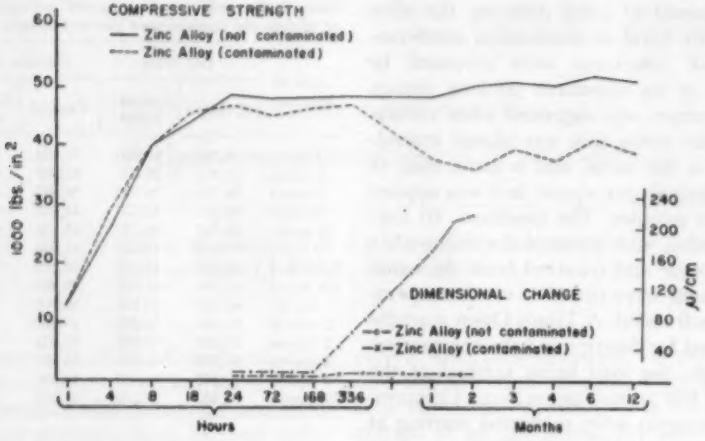
RESULTS

The composite data appear in the table. It is apparent that contamination of the zinc alloy did cause a considerable reduction in strength. The data for this alloy are graphically illustrated in the chart. The strength values of the contaminated and uncontaminated specimens during the first two weeks were within the experimental error for this type of test. The strength of the contaminated specimens at the end of one month, however, dropped approximately 9,000 pounds per square inch and remained at 40,000 pounds for the remainder of the test period. No importance should be attached to the small fluctuation which occurred during this interval. On the other hand, the strength of the uncontaminated specimens of the zinc alloy continued to rise, eventually exceeding 50,000 pounds per square inch. This slow continual rise in the compressive strength over a long period of time has been shown in previous research.[5]

Thus, at the end of one year there was a difference of 12,000 pounds per square inch in the strengths of the contaminated and uncontaminated specimens. The amount of reduction was 24 per cent. Slight variations in strengths are not of clinical significance, but there can be no doubt that a reduction of this magnitude is important. At one time in A.D.A. Specification No. 1 there was a compressive strength requirement of a minimum strength of 35,000 pounds per square inch at the end of 24 hours, and there was some indication that even this value was too low. It is quite possible that if other alloys had been tested, the ultimate strength might have been even lower than the results shown here. At any rate, resistance to fracture is based on proper cavity preparation and adequate strength in the alloy; alloy strength of only 40,000 pounds per square inch or less will increase the possibility of fracture under normal biting stress.

It is interesting to note that the loss in strength coincides closely with the delayed expansion. In the illustration the dimensional change is plotted, from one day through two months, of both uncontaminated and contaminated specimens

5. Phillips, R. W. Compressive strength of amalgam as related to time. J. D. Res. 28:348 Aug. 1949.



Strength and dimensional change in control and contaminated specimens. Scale is not uniform

of this same alloy. The beginning of the delayed expansion is apparent at ten days and has reached a value of over 200 microns per centimeter by the end of two months. The uncontaminated specimen, of course, shows no significant change during this time. Thus as the reaction progresses within the alloy, there is a decrease in strength, apparently due to the formation of internal voids of hydrogen gas and internal corrosion.

The nonzinc alloy showed no difference in strength at various time intervals, whether contaminated or uncontaminated. It is obvious then that the loss in strength must be associated with the reaction between the zinc and the saline solution. These data should not be construed as an endorsement of nonzinc alloys, since there are many other factors that must be considered. The purpose of this study was merely to determine the effect of moisture on the compressive strength and its relationship to the delayed expansion phenomenon.

SUMMARY

A study of the effect of moisture contamination on the compressive strength of amalgam has shown:

1. Contamination of a zinc alloy produces a loss in strength at the end of one year of 12,000 pounds per square inch, a 24 per cent reduction in strength of the contaminated specimens compared with that of the uncontaminated specimens.

2. The loss in strength becomes apparent at the end of one month, occurring simultaneously with the delayed expansion reaction.

3. The loss in strength is of clinical significance and could unquestionably increase the possibility of fracture when the restoration is subject to stress.

This research emphasized again the necessity of avoiding any possible moisture contamination of amalgam during mixing and condensation.

Tooth morbidity experience of adults

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In attempting to draw the picture of dental needs of adults and to estimate the requirements which must be met in planning a prepayment dental care program, one may turn to several sources for data.[1-4] The information available for adults, however, is generally restricted to specified occupational groups and is sometimes limited to those patients who are economically solvent and who seek dental service from private practitioners under the prevailing fee-for-service system in the United States.

The U. S. Public Health Service maintains a full range of medical and hospital services for merchant seamen, the Coast Guard and other persons entitled by law to receive such care. Over 200 dental officers assigned to nearly 100 field stations treat without charge approximately 100,000 persons each year. Each patient seeking service is examined by a dentist, and a summary of the results of the examination is forwarded to headquarters for administrative use. The records, even though some types of beneficiaries are underrepresented in them, reveal in a gross way the changing picture of dental needs associated with the aging of individuals and permit an analysis of dental needs without the necessity of weighting for economic considerations.

It is the purpose of this article, therefore, to describe the tooth morbidity experience revealed by nearly a quarter of a million dental examinations and to show the cumulative effect of dental disease with advancing age in a selected population group.

METHOD

Data for this study were abstracted from reports received for all or parts of five fiscal years covering a period from 1948 to 1952. Only those reports for a patient's first examination within a fiscal year were used. Although more than 20 classes of beneficiaries received care in U. S. Public Health Service facilities, for the purpose of this study all have been grouped together. The merchant seamen and Coast Guard beneficiaries together represent 70 per cent and the U. S. Public Health Service officers 5 per cent of the total;

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1. Health of ferrous foundrymen in Illinois. U. S. Public Health Service Publication No. 31, Industrial Hygiene Division, U. S. Public Health Service and Industrial Hygiene Division, Illinois Department of Public Health. Washington, D. C., Government Printing Office, 1950. p. 112.

2. Brinton, H. P.; Johnston, D. C., and Thompson, E. O. Dental status of adult male mine and smelter workers. Pub. Health Rep. 57:218 Feb. 13, 1942.

3. Hollander, Franklin, and Dunning, J. M. A study by age and sex of the incidence of dental caries in over 12,000 persons. J. D. Res. 18:43 Feb. 1939.

4. Moen, B. D. Survey of needs for dental care. II. Dental needs according to age and sex of patients. J.A.D.A. 46:200 Feb. 1953.

Table • Tooth morbidity experience* of U.S. Public Health Service beneficiaries, 1948 to 1952

Age group	DMF rates				Extractions indicated	Teeth needing filling
	Total	Decayed teeth	Missing teeth	Filled teeth		
All ages	19.1	2.1	11.5	5.5	1.3	1.9
15 to 24	14.4	3.7	4.4	6.3	.7	3.6
25 to 34	16.2	2.8	6.0	7.4	.8	2.5
35 to 44	18.6	1.9	10.2	6.5	1.4	1.7
45 to 54	21.2	1.2	15.3	4.7	1.7	1.0
55 to 64	23.4	.9	19.4	3.1	2.2	.7
65 and over	26.2	.2	23.8	1.9	2.0	.3

*All rates pertain to permanent teeth and are computed on the basis of a full complement of 32 teeth. Rates for "All ages" have been adjusted to the 1950 distribution of white males 15 years of age and older as reported by the U. S. Census.

the balance is nearly evenly divided between inmates of federal penal institutions and beneficiaries classified as "other." Except for relatively small groups of dependents in some categories, the beneficiaries for the most part were employed men preponderantly in the young adult age group.

There were substantial differences in the age distribution of different classes of beneficiaries. Four fifths of the Coast Guard group were in the 15 to 34 year age interval, while slightly more than 70 per cent of the patients in the penal group were in that age group. Approximately half of the merchant seamen, U. S. Public Health Service officers and "other" patients were under 35 years of age.

Data describing permanent dentition were tabulated for each class of beneficiaries, and only those data pertaining to adults 15 years of age or older were used. Tabulations were prepared and rates computed to show numbers of decayed, missing and filled teeth per patient by 10-year age groups for all beneficiaries. The totals, except where otherwise noted, pertain to a full complement of 32 teeth. Teeth that were both filled and carious are included in the total for carious teeth. The totals for missing teeth refer to permanent teeth which were absent at the time of examination and may include unerupted or congenitally missing teeth. Teeth indicated for extraction were considered present and were tallied with other teeth present, either carious or filled.

The distribution of the 1950 U. S. population 15 years of age and older was used as the basis for age adjustment which, in effect, was equivalent to projecting the rates as estimates for an average individual 41 years of age. Rates for the total five year period are simple arithmetic averages of the rates obtained for single years.

RESULTS

The age-adjusted rate based on the total tooth morbidity experience (table) indicates that 19.1, or about 60 per cent, of the 32 permanent teeth which may erupt are affected by dental disease to the degree that they are carious or have been filled or extracted by the time a patient is 41 years of age. Not only does this average value, which for the sake of brevity may be referred to as the DMF rate, indicate the experience revealed by sampling records from five different fiscal years, but it also closely approximates the rate for each of the years for which data are available. This DMF rate, however, may understate slightly the total evidence of dental disease which was apparent at the time of examination; it does

not include sound teeth that are indicated for extraction because of soft tissue disease.

The number of teeth needing extraction, which was tabulated for all years except 1948, was 1.3 teeth per patient. A special review of a sample of records abstracted from the 1951 reports indicates that decay was the primary reason for tooth loss in about a third of these cases. For the balance, periodontal disease or some other factor was reported as the most immediate indication for extraction. It seems likely that a high proportion of these teeth indicated for extraction showed evidence either of present caries or of a filled cavity and therefore are already included in the DMF counts. For this reason the DMF rate, representing the sum total of decayed, missing and filled teeth as reported, has been used to represent the total dental disease experience of the several groups for which data are presented in this report.

On the basis of the teeth studied, the DMF rate per person represents approximately 2 decayed teeth, 5½ filled teeth and 11½ missing teeth. Other tabulated data reveal further that 1⅓ teeth were in need of extraction and nearly 2 teeth per patient needed fillings to correct restorable carious teeth or to replace existing fillings which were defective.

It is emphasized that these average counts are based on tallies of values for a full complement of 32 teeth. Averages so obtained are increased more sharply than might be expected by the addition of third molars to the more usual count of 28 teeth.

Data on the effect of this change are limited. They were obtained from a review of approximately 2,000 dental charts selected as representing all beneficiary groups in 1951. Tallies made from these selected charts suggest that within the total experience reported, 3.3 of the 19.1 DMF teeth, or more than ⅙, were third molars. Within the counts of decayed and missing teeth and of teeth needing

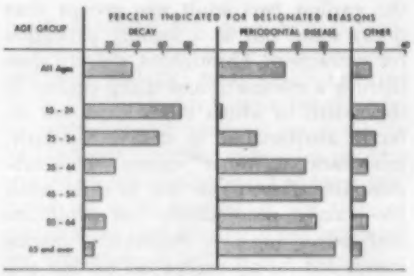

Fig. 1 • Percentage distribution of teeth indicated for extraction by age groups. (1951 data)

fillings, third molars represented ⅛ of the teeth so affected. In the counts of extractions needed and of filled teeth, their proportionate representation was less. One eighth of all teeth which needed extraction and less than 1/10 of the number of filled teeth present at the time of examination were third molars.

AGE-SPECIFIC RATES

Age-specific tooth morbidity rates reflect the cumulative effect of dental disease with advancing age. On the average a beneficiary had a caries experience of 19.1 decayed, missing and filled teeth; this average represents a process which starts with the decay, or loss, of the first permanent tooth in early life and continues over the life span, until, for the age group 65 years and older, it affects 26.2 teeth out of the 32 which erupt in the average mouth. Obviously this high rate cannot be attributed to caries alone. With advancing age the significance of caries as an immediate cause of tooth loss diminishes; and the importance of extractions, made because of periodontal disease and for prosthetic considerations, becomes increasingly great.

This fact is strikingly portrayed by the 1951 data. The relative importance of decay, periodontal disease and other factors, such as prosthetic considerations and fractures, is shown in Figure 1. Only in

the earliest two adult age groups does decay stand out as a leading indication for extraction. Throughout the life span there is a consistent and sharp decline in the extent to which tooth losses are directly attributable to decay. Similarly, miscellaneous "other" causes which substantially affect tooth loss in early adult life become progressively less significant with advancing age. Periodontal disease stands out for all except the earliest two adult age groups as the dominant reason for extraction.

Data presented in the table reveal the almost constant increase in the total DMF rate from one ten-year interval of adult life to another. In the approximately 50 years of life intervening between the average age for the youngest age group and that for the oldest age group, the rate changed from 14.4 to 26.2. This is an increase of 11.8 in the number of DMF teeth, or about ¼ a tooth per year throughout the span of life. While this change is moderate as contrasted with the experience of school-age children, for whom the increment was approximately 1 tooth per child per year, it is significant that the rate established in early adult life increases at so nearly constant a rate over the long span of years involved.

It is noteworthy also that the component parts of the DMF rate vary decidedly in proportion as age advances. Decayed and filled teeth represent an ever smaller proportion of the total, whereas missing teeth are almost the sole element in the high DMF rate of late adult life. Over the 50 year span the number of missing teeth increased from 4.4 to 23.8 per person. This change indicates that the average loss per year was about $\frac{1}{10}$ tooth per person.

In the rates for decayed teeth per person, there was an essentially constant proportionate decline from one decade of life to another. The rate for any selected age group was only about two thirds as great as that for the decade of life immediately preceding. Whereas the number of filled teeth per person increased slightly between the first and second decades of adult life, thereafter there was a steady and almost constant rate of decline over succeeding decades.

The average number of teeth indicated for extraction was not great. In the youngest age group the rate was only $\frac{7}{10}$ tooth per patient. This average was doubled for the 35 to 44 year age group, and for patients 55 years of age and older it was three times as great as for the individuals in the youngest age group. The number of fillings needed, on the other hand, declined steadily with advancing age and paralleled very closely the trend of averages for decayed teeth.

The remarkable conformity of the DMF experience of U. S. Public Health Service beneficiaries, as determined by examination of those seeking care, with the experience for complete population groups is evident from data in Figure 2. The average DMF values shown in the table are shaded above the age scale to show the average experience of all beneficiaries examined within the age interval.

On the same chart are plotted the average DMF rates observed for all school children enrolled in kindergarten through the ninth grade at the onset of two treatment cycles in Richmond, Indiana.[5] These data reveal year by year changes for a school population where annual DMF increments are approximately 1 tooth per child per year.

Finally, age-specific DMF rates for 3,388 male home office employees of the Metropolitan Life Insurance Company are plotted above the mid-points of the age intervals to which they apply.[3] These data pertain to a group of employees who are examined routinely without regard to dental care needs which may exist.

The data for U. S. Public Health Service beneficiaries and the Metropolitan

5. Waterman, G. E., and Knutson, J. W. Studies on dental care services for school children; first and second treatment series, Richmond, Ind. Pub. Health Rep. 68:583 June 1953.

Life Insurance group indicate that the DMF rate increases steadily during childhood and continues to rise after the age of 20 but with reduced annual increments.

The slightly lower values for U. S. Public Health Service beneficiaries compared with those for the Metropolitan Life Insurance men between ages 25 and 45 may reflect the differences of the groups sampled. The slight differences between the DMF rates of the two groups emphasize the remarkable similarity in the DMF patterns of adults. Small as they are, however, these differences indicate the difficulty one might encounter in establishing premium rates for a small or selected group that may be willing to purchase dental care on a prepaid basis.

The close correlation between tooth mortality and the total DMF rate for U. S. Public Health Service beneficiaries to whom dental services are available without cost is similar to that for patients treated by private dentists. The tooth loss, based on teeth missing at the time of examination and also on those indicated for extraction, is plotted in Figure 3.

In the data for this chart adjustments were made to reflect the tooth loss exclusive of third molars. Therefore, the results were comparable to those reported by Moen, which were based on examinations of male patients treated by dentists in the course of their regular practice.[4] The agreement in the tooth mortality

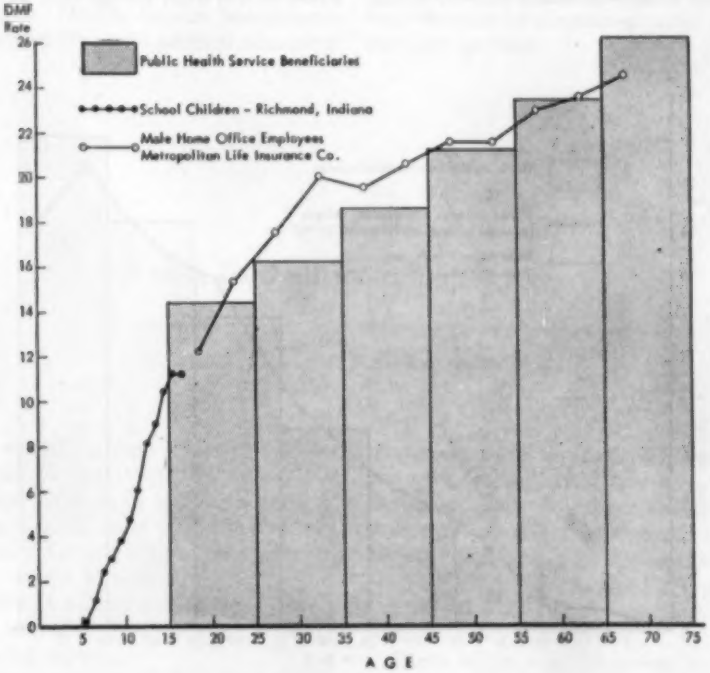

Fig. 2 • Correlation of age and DMF rates for U. S. Public Health Service beneficiaries, male office employees of an insurance company and children of school age. (Values for third molars included)

data for these two groups of adult males lends support to a belief that the total DMF experience of the group studied by Moen and the U. S. Public Health Service beneficiaries was similar throughout adult life even though direct comparisons of DMF rates are not possible.

The limited experience of the school group examined at the outset of the two treatment cycles in Richmond, Ind., is presented to provide further comparison. Again the agreement in the trends suggests that the tooth mortality of U. S. Public Health Service beneficiaries is closely correlated with that of persons in the general population.

SUMMARY

Tooth morbidity data were obtained from the analysis of nearly 225,000 dental examinations which were made of U. S. Public Health Service beneficiaries over a five year period. Of the possible 32 teeth of beneficiaries with an average age of 41 years, 19.1 or 60 per cent (adjusted to a standard population base) were decayed, missing or filled.

As age advances, the DMF rate increases, and missing teeth contribute the greatest weight to the total tooth morbidity index after patients are 35 years of age. The number of decayed teeth and filled teeth becomes increasingly smaller with age, and the number of unaffected teeth remaining in the mouth decreases. The number of teeth indicated for extraction increases with age, and the number of teeth needing fillings decreases with age.

The tooth morbidity experience of the adults in this study reveals that the DMF

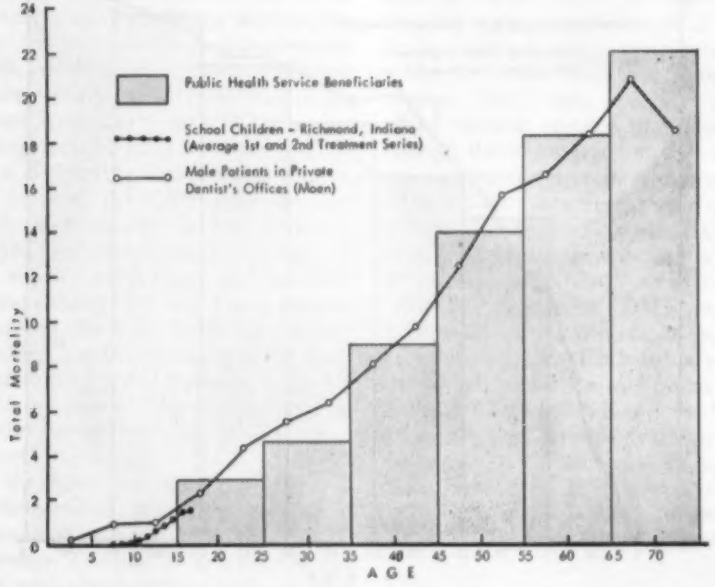

Fig. 3 • Correlation of age and tooth mortality for U. S. Public Health Service beneficiaries, male patients treated by private practitioners, and children of school age. (Values for third molars not included)

rate increases about ¼ tooth per year over 50 years of adult life. Even though the annual DMF increment is only ¼ tooth, the component of the DMF rate represented by missing teeth increases at the rate of $\frac{1}{10}$ tooth per year. The explanation is that missing teeth may represent teeth which were previously classified as sound, carious or filled.

For patients under the age of 35 the primary cause for tooth loss is dental caries, whereas above that age periodontal disease is the controlling factor in tooth loss.

The total DMF experience of the patients reported in this study was remarkably similar to that of the male employees of the Metropolitan Life Insurance Company. Even more noteworthy was the similarity between the tooth mortality experience (including third molars) of the Public Health Service beneficiaries and that of the male patients who were treated by private practitioners as reported by Moen.[4]

CONCLUSION

The DMF data presented in this study of adults and in others as well suggest that dental diseases as they occur in general population groups, unaffected by some specific disease factor, are predictable within reasonable limits. These data describe the dental problem in a gross way but do not define specific treatment needs for meeting the problem.

Obviously, even though tooth morbidity is reasonably predictable, it will require considerable experience with the operation of prepaid dental plans for defined population groups to know what service demands will be. In each plan therefore the group to be served must be defined, and the demands for service will be influenced by conditions under which the plan operates.

Latex football mouthpieces

Howard H. Dukes, D.D.S., Kansas City, Kan.

There is nothing more disheartening for a dentist to hear than that a boy has fractured his anterior teeth as a result of playing football. The boy will need not only emergency treatment but also attention to the injured teeth for the rest of his life. A broken arm or leg will heal, but a fractured tooth is a permanently disfiguring injury.

A survey made by the Security Life and Accident Company[1] shows that injuries occur to one out of five participants in sports. Of these injuries, 86.3 per cent occur in football, only 9.4 per cent in basketball. Thirty-seven per cent of football injuries are incurred by first year players, 32.5 per cent by second year players, 22.3 per cent by third year players and only 8.2 per cent by the more experienced fourth year players.

These results were borne out by a re-

1. A study of athletic injuries. Denver, Security Life and Accident Co.

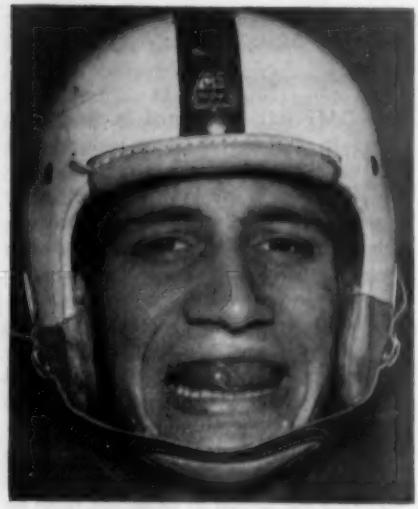

Fig. 1 • Latex mouthpiece in place

cent survey[2] made in one of the Kansas City, Kan., high schools, where 35 junior and senior football players were examined. Of this group 8, or 22.8 per cent, had received damaging blows to their teeth while playing football.

In the 1954-1955 *Handbook of the National Federation of High School Athletic Associations*,[3] football injuries are listed as follows: face and dental, 53.9 per cent; knee, 19.6 per cent; shoulder, 13.7 per cent; head, 9.7 per cent; and pelvic, 3.7 per cent. It is imperative, therefore, that when the football recruit is issued his first football uniform, he should be provided with some adequate means of mouth protection.

In their recent article Watts, Woolard and Singer[4] stated: "Schools spend on an average $90 to $120 annually to outfit each football player with protective clothing, which affords him protection only for those regions in which 48 per cent of the injuries occur." A comfortable, well-fitting mouthpiece costs less than a pair of football shoes. It should become standard equipment.

Nat S. Fleischer,[5] editor of *The Ring* magazine, stated that the first rubber mouthpiece was used in 1913 by Ted Kid Lewis, an English boxer, who liked it so well that he continued to use it in spite of the protests filed by opposing managers and boxing commissions. Henceforth, other boxers adopted the mouthpiece, and it is now used universally.

During the 1952 football season, 18 per cent of the players on one of the Kansas City, Kan., high school teams suffered dental casualties. Over $500 was spent by the school and insurance companies for the initial treatment of these injuries. Ten per cent of the football players in another high school injured their teeth. The following year, 110 individually fitted latex mouthpieces were constructed for the players of these two schools and one other high school in the Kansas City, Kan., area. While wearing the protective mouthpieces, no players incurred dental injuries, and the physician for one of the teams was convinced that in one instance the use of the mouthpiece prevented a fracture of the jaw.

Since *Life* magazine[6] published pictures of the "toothlesss" members on the Notre Dame football team, parents have become much more reluctant to allow their sons to play football. Coaches, of course, are anxious to give their players all the protection possible and to overcome some of the parental objection to the game.

To be effective, a mouthpiece (Fig. 1) must be fitted to the individual's mouth, afford adequate protection, stay in place

2. Dental football survey made by Glenn D. Asbell, Lee C. Berns, Howard H. Dukes and Aubrey A. Gentry.

3. Handbook of the National Federation of High School Athletic Associations, 1954-1955. Chicago.

4. Watts, George; Woolard, Archie, and Singer, Carl E. Functional mouth protectors for contact sports. J.A.D.A. 49:7 July 1954.

5. Fleischer, Nat S. Personal communication.

6. The fighting Irish look tough again. Life 33:60 Sept. 29, 1952.

comfortably and securely and allow mouth breathing and speech. At least one mouthpiece is being produced commercially which can be fitted individually after it has been heated. It is the nearest equivalent to a tailor-made mouthpiece that is being produced. This mouthpiece has proved so satisfactory that now a $250 dental accident insurance policy is issued to the players who wear it.

TECHNIC FOR CONSTRUCTION

1. An alginate impression of the upper teeth is taken, and a stone model is poured (Fig. 2, left).

2. In the waxup two thicknesses of baseplate wax, ⅛ inch thick, are adapted to the teeth. A feather-edge margin is made ¼ inch above the gingival line on the buccal, labial and lingual surfaces (Fig. 2, center).

3. Large sprues are waxed to both heels (Fig. 2, right). The sprues should be the size of the little finger in diameter and 1½ inches long.

4. The assembly is invested in plaster with sufficient bulk to cover the entire wax pattern and trimmed so that the invested model will stand with both sprues extending upward (Fig. 3, left).

5. The wax is boiled out, and the mold is flushed with hot water and chloroform.

6. The liquid latex may be poured after the mold has stopped steaming or after it has entirely cooled. The latex will shrink, so that it is necessary to keep adding latex to the sprue holes four to six times.

7. The latex is allowed to set overnight. No heat is required; the latex cures by dehydration. The mouthpiece is separated from the mold and allowed to cure in the air for 12 to 24 hours (Fig. 3, center).

8. The sprues are cut off, and the mouthpiece is trimmed with scissors (Fig. 3, right). The player's name is marked in the rubber. No polishing is necessary.

DENTAL SOCIETY PROJECT

The members of the Wyandotte Dental Society, comprising the dentists in Wyandotte and Johnson counties in Kansas, are making these individually processed latex mouthpieces available to the 12

Fig. 2 • Left: Stone model with mouthpiece outlined. Center: Model waxed. Right: Large sprues added

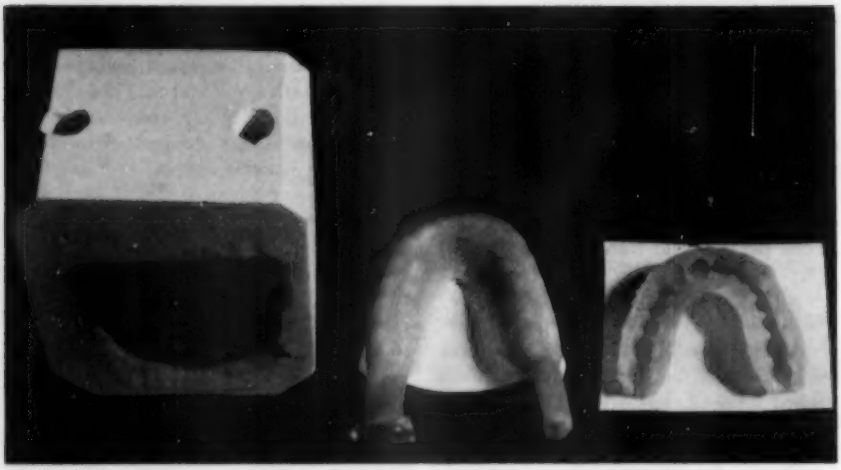

Fig. 3 • Left: Model invested in plaster after boiling out wax. Center: Latex mouthpiece before trimming. Right: Mouthpiece trimmed and ready for placing in mouth

high school football teams in the two counties at a nominal cost. Arrangements have been made with the local laboratories to process the mouthpieces for the Society; therefore, the amount of office time has been reduced to the time necessary to take one impression of the upper teeth and to pour one model.

This project, while rendering an excellent service to the players of these various teams, is proving to be one of the best public relations projects this Society has ever undertaken.

Published reports state that dental casualties have been reduced to zero when a protective mouthpiece is worn. It behooves the members of the dental profession to encourage the adoption of the mouth protector. It is one effort in preventive dentistry which produces immediate and tangible results.

754 Brotherhood Building

Conservation of Health • Human health is the most valuable of our natural resources, and there has never been a time in the history of man when the human race needed so desperately to conserve its physical, mental and moral health and strength. *James S. Simmons, "Education for Careers in Public Health," Postgraduate Medicine 13:281 April 1953.*

Effect of progressive muscular dystrophy on occlusion

Raymond A. White, D.D.S., San Pedro, Calif., and Alvin M. Sackler,† D.D.S., New York*

The tendency in patients with progressive muscular dystrophy for the dental arches, or segments thereof, to expand has been noted by various observers. This can be accounted for partially by the reduction in function in the muscles of the cheeks and lips in contrast to a disproportionate reduction of function of the muscles of the tongue. Murray[1] considered the form and structure of bone a compromise between many factors. In 1892 Wolff[2] concluded, after studying bones affected by altered function with resulting changes in stresses, that the internal and external architecture of the bone depends on the function to which it is subjected.

The objective of the present study was to devise a method to determine the various tensions that the groups of muscles of the cheeks, lips and tongue bring to bear directly against the teeth and entire alveolar process. These tensions can be studied particularly well in patients with progressive muscular dystrophy since a great deal of change in the arch form may be noted in these subjects—changes that lead to open bite, expanded arches with labioversion and buccoversion of the teeth, and to various irregularities in the intercuspal relationship of the maxillary and mandibular teeth.

Figures 1 and 2 are examples of the dentition of patients, 12 and 15 years old respectively, with pseudohypertrophic progressive muscular dystrophy. Figure 3 is an example of the dentition of a patient who has suffered from muscular atrophy which has become progressively worse since he was 12 years old. Figure 4 shows the dentition of a 47 year old woman with atrophy of all extremities and with a prominent tongue.

Muscular degenerative diseases may be due secondarily to diseases of the nervous system, in which case they are grouped under the general classification of neuropathies, or the pathologic condition may result from primary degenerative disease within the muscles themselves. The latter are classified under a general group consisting of the myopathies.[3] Many elaborate classifications of myopathies have appeared since their study was begun about 100 years ago. From the standpoint of basic pathology, however, the microscopic changes and metabolic disturbances are probably identical in all cases,

This paper has been accepted in partial fulfillment of the requirements for completion of the full time course of training in periodontics.

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†Instructor in periodontia, New York University College of Dentistry; in charge of periodontia department, Jewish Sanitarium and Hospital for Chronic Diseases, Brooklyn, N. Y.

1. Murray, P. D. F. Bones: a study of the development and structure of the vertebrate skeleton. New York, Cambridge University Press, 1936.

2. Brown, J. C., and Losch, P. K. Dental occlusion in patients with muscular dystrophy. Am. J. Orthodont. & Oral Surg. 25:1040 Nov. 1939.

3. Ramsey, R. R., and McCarrol, H. R. Problem of muscular dystrophies. J.A.M.A. 150:659 Oct. 18, 1952.

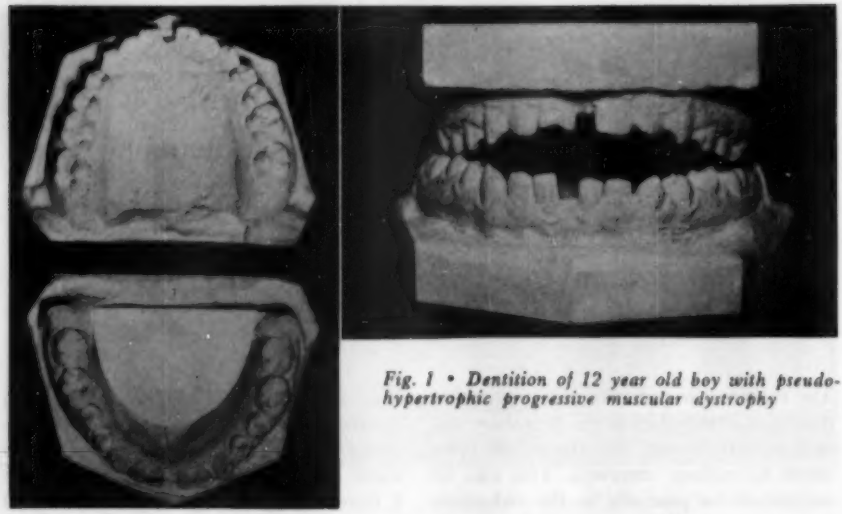

Fig. 1 • Dentition of 12 year old boy with pseudohypertrophic progressive muscular dystrophy

and they do not represent separate and distinct diseases but rather forms or units of one large pathologic process; namely, progressive muscular dystrophy.[4] Tyler and Wintrobe[5] stated that the great majority of cases of myopathy fall into two clinical categories—the pseudohypertrophic or juvenile type and the facioscapulohumeral type of progressive muscular dystrophy.

TYPES OF PROGRESSIVE MUSCULAR DYSTROPHY

The pseudohypertrophic form or the juvenile type of progressive muscular dystrophy occurs more often. In practically all instances it has its onset during the first decade of life, usually when the patient is between the ages of five and ten. Most of the patients are male. Usually such a child has increasing difficulty in keeping up with his friends, falls with increasing frequency and has more and more difficulty in getting up. Pseudohypertrophy, an enlargement caused by deposition of fat among the muscle fibers, may superficially give the appearance of excellent muscular development and power.

In the facioscapulohumeral form of the disease, the muscles of the face, shoulder girdle and upper arms are affected earliest. Generally the patient is first aware of muscular symptoms at about puberty, although in many instances weakness of the facial muscles may occur early in childhood. The typical facial appearance—loss of substance about the mouth while the lips appear thickened and separated—often is regarded as a familial characteristic rather than a familial disease. Likewise, the inability to whistle and general impairment of facial expression are disregarded by the patient until weakness in raising the arms suggests the presence of a serious disease. The disease often occurs in several members of the same family. It is transmitted by a direct dominant hereditary factor,

4. Milhorat, A. T. Observations on the pathogenesis of progressive muscular dystrophy. New York Hospital, New York.

5. Tyler, F. H., and Wintrobe, M. M. Studies in disorders of muscle. The problem of muscular dystrophy. Ann. Int. Med. 32:72 Jan. 1950.

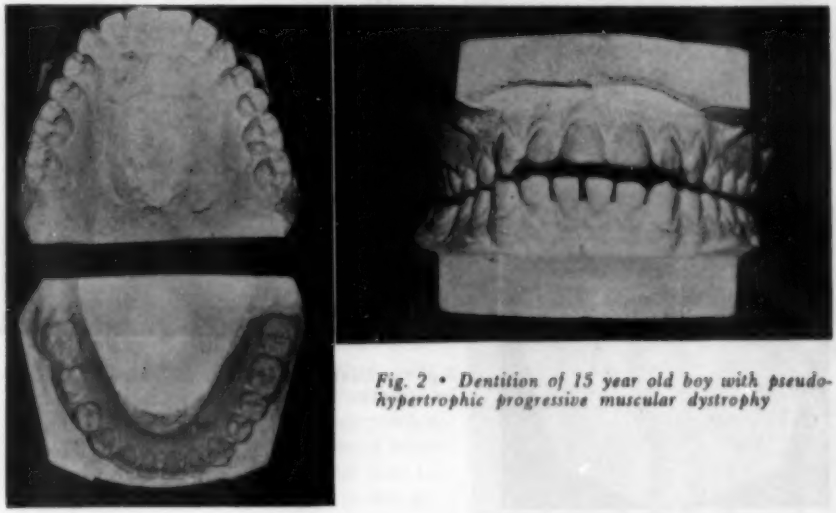

Fig. 2 • Dentition of 15 year old boy with pseudohypertrophic progressive muscular dystrophy

and affects males and females equally. The pseudohypertrophic form is believed to be transmitted by a sex-linked recessive factor, and in other cases, multiple recessive factors are thought to be responsible.

METABOLIC CHANGES

Variations in the elimination of creatinine are of considerable significance in the diagnosis and pathogenesis of progressive muscular dystrophy, but are not applicable to the subject of this investigation and the following discussion. Neither are the metabolic changes of a similar condition in rabbits seemingly induced by a deprivation of vitamin E.

ORAL MANIFESTATIONS

The most apparent oral manifestation of progressive muscular dystrophy seems to be the malocclusion that results from reduction of function of certain groups of muscles because of the degeneration of muscle fibers. Whether other subclinical oral pathologic conditions coexist along with muscular degeneration has not been determined as yet, but there seems to be no greater incidence of periodontal disease or caries than among average individuals. Brown and Losch[2] and Futterman[6] have observed various patients with progressive muscular dystrophy and have found that invariably there is a shifting of the teeth out of proper occlusion. In the present study, similar observations were made at the Jewish Sanitarium and Hospital for Chronic Diseases in Brooklyn, N. Y., in seven patients with progressive muscular dystrophy. Two patients did not show any evidence of malocclusion, but the other five showed varying degrees of outward shifting of the teeth.

It must be realized that the forces that act against the teeth and arches come from various sources and directions, with different intensities and time intervals, and each one of these forces or components thereof would tend to move a tooth

6. Futterman, M. J. Dental anomalies associated with pseudohypertrophic muscular dystrophy. D. Outlook 27:73 Feb. 1940.

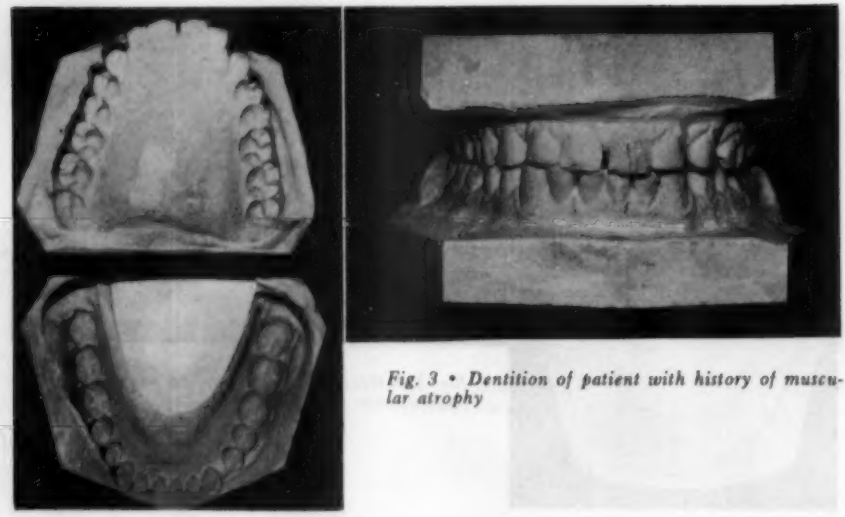

Fig. 3 • Dentition of patient with history of muscular atrophy

in a certain direction. Consequently, it may be said that the teeth assume a position in which all muscular forces acting against them are in biophysical equilibrium; by biophysical in this statement is meant that equilibrium is not merely a physical equilibrium but rather one in which resultant units of time-force-intensities create equal tissue reactivity in any direction. Such a viewpoint has been substantiated by Salzmann,[7,8] McCoy[9] and Strang[10] who have indicated that

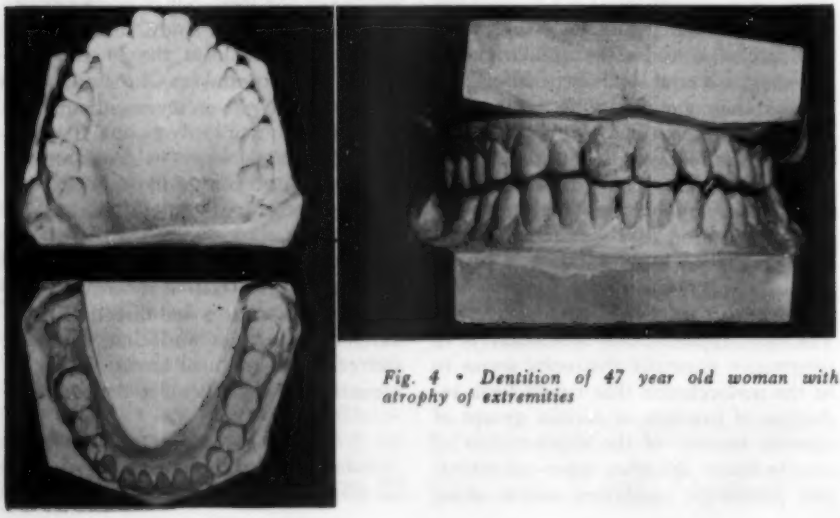

Fig. 4 • Dentition of 47 year old woman with atrophy of extremities

teeth find a position where there is as much pressure exerted on them by forces which drive them in one direction as by forces which drive them in the opposite direction, the net result of opposing forces being zero. The teeth are then considered to be in a state of equilibrium.

In patients with progressive muscular dystrophy, it may be assumed that there is a disturbance of biophysical equilibrium because of a loss of function of certain groups of muscles. This loss of function forces the teeth and arches to a new position in the direction in which muscular function has been weakened; also, the teeth and arches will continue to move in that direction until they reach a point of equilibrium. The degree of repositioning of the teeth and arches may be proportional to the difference in the degree of loss of function between antagonistic muscle groups. Miller[11] has stated that it is the loss of function of the cheek and lip muscles that accounts for the outward shifting of the teeth and consequent malocclusion even though the activity of the tongue may be reduced. In such instances, the functional activity of the tongue may be reduced only by 10 per cent while functional activity of the cheeks or lips may have been reduced by 50 per cent. Consequently the amount of repositioning of the teeth and arches may depend on this percentage difference.

MEASUREMENT OF LOSS OF FUNCTION OF MUSCULATURE

Quantitative measurement of and comparison between the amount of loss of function of the tongue, cheek, and lip musculature may yield information that would indicate the role that muscular forces play in the molding of the dental arches and the positioning of the teeth. The myodynamic recorder designed and described by Alderisio and Lahr,[12] the technic of electromyography as used by Pruzansky,[13] and the method of measuring muscular forces against the teeth described by Feldstein[14] are useful approaches to this problem. In the present study, however, it was decided to make use of a mercury manometer and rubber balloon to obtain the measurements, because in this way it was possible to meas-

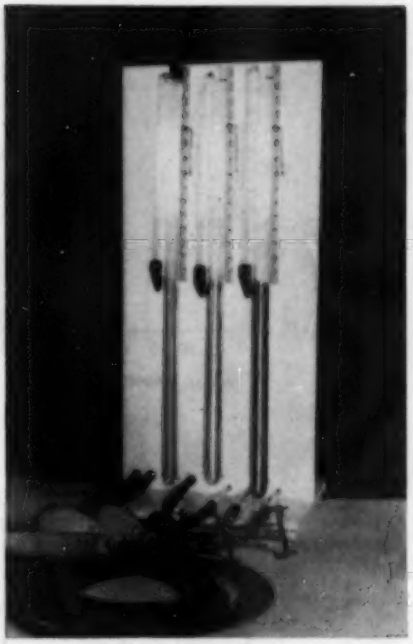

Fig. 5 • Apparatus for measurement of muscular forces

7. Salzmann, J. A. Criteria for extraction in orthodontic therapy related to dentofacial development. Am. J. Orthodont. 25:584 Aug. 1949.

8. Salzmann, J. A. Principles of orthodontics. Philadelphia, J. B. Lippincott Co., 1943.

9. McCoy, J. D. Applied orthodontics. Philadelphia, Lea & Febiger, 1941.

10. Strang, R. H. W. Factors of influence in producing a stable result in the treatment of malocclusion. Am. J. Orthodont. & Oral Surg. 32:313 June 1946.

11. Miller, S. C. Personal communication.

12. Alderisio, J. P. An electronic technic permitting multiple registration of oral myodynamics. J. Michigan D. A. 34:97 May 1952.

13. Pruzansky, S. The application of electromyography to dental research. J.A.D.A. 44:49 Jan. 1952.

14. Feldstein, L. An instrument for measuring muscular forces acting on the teeth. Am. J. Orthodont. 36:856 Nov. 1950.

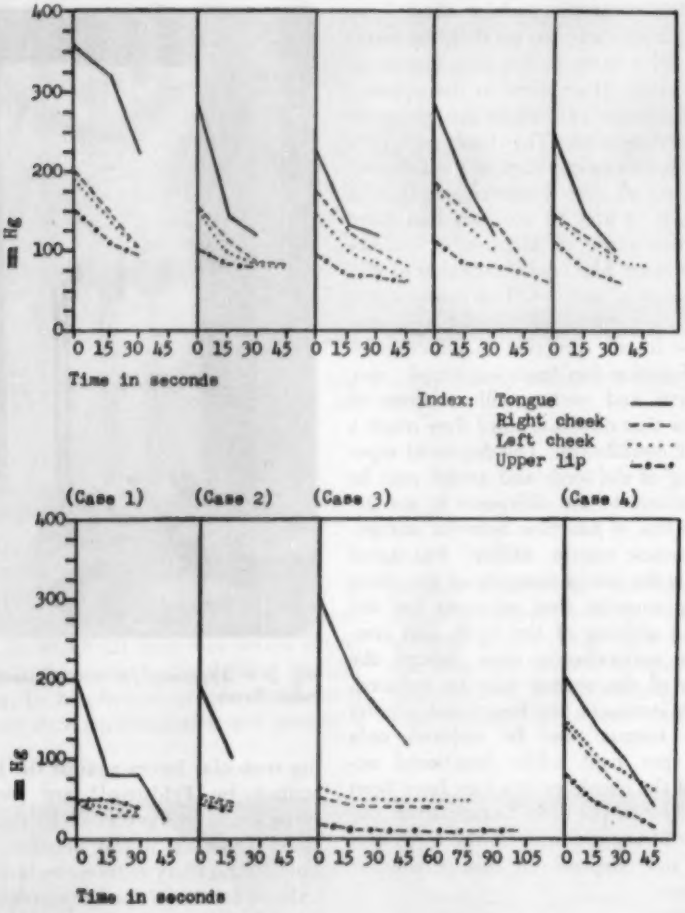

Fig. 6 • Above: Group 1, four normal cases. Below, Group 1, four cases of progressive muscular dystrophy. The sustained muscular contraction is plotted against time in seconds until fatigue intervenes. Note lower initial and lower terminal pressures in group with muscular dystrophy

ure pressures of groups of muscles against whole segments of the dental arches.

APPARATUS

The apparatus is inexpensive and simple to build (Fig. 5). Two mercury manometers and a water manometer are connected by rubber tubing to reinforced rubber balloons. Between each balloon and its respective manometer is attached, by means of a T-tube, a sphygmomanometer rubber bulb which permits the inflation of the balloon without disturbing the level of the mercury column. Just enough air is pumped into the balloon to distend it without stretching the rubber, so that the manometer reading remains

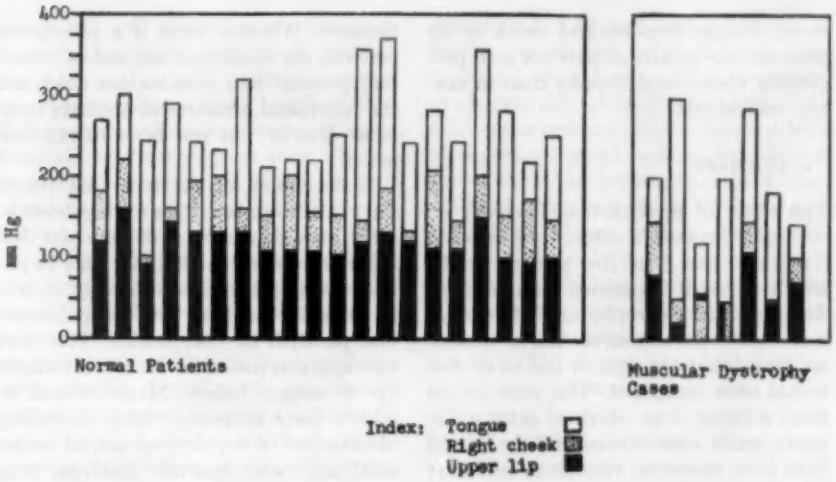

Fig. 7 • Group 2. Pressures of 20 normal subjects compared with 7 subjects with muscular dystrophy. Although tongue pressure is greater than cheek pressure in both subjects with dystrophy and normal subjects, in the normal subjects the difference between the two readings generally is less than in subjects with muscular dystrophy

at zero. The balloon is then placed in the mouth of the subject in the area to be studied; that is, (1) between the tongue and the lingual aspect of the anterior teeth; (2) in the vestibule of the mouth between the cheek and the posterior teeth; and (3) in the vestibule between the lip and the anterior teeth. The subject then is instructed to compress the balloon forcefully against the teeth with tongue, cheek or lip. The water column of the apparatus, being extremely sensitive, was intended to measure relaxed normal pressures against the teeth, but the results were so variable with each patient that they were put aside to await development of a proper technic for this measurement. These relaxed normal pressures may be a significant factor in tooth positioning.

OBSERVATIONS

In the first group of patients studied there were four individuals with progressive muscular dystrophy and five normal individuals. The patient exerted maximum muscle pressure against the balloon continuously until fatigue became unbearable and compelled him to stop. The initial high point of the mercury column was recorded, and readings were noted every 15 seconds as pressure subsided. In a second series of measurements, taken in a group of 20 normal subjects and 7 with progressive muscular dystrophy, only the initial pressures against the balloon by tongue, cheek or lips were recorded without regard to the ability to maintain the pressure. The results are charted for comparison in Figures 6 and 7. The statistical significance of the figures has not been determined as yet; for the present it can be noted that (1) in general the muscle pressures of normal individuals were greater than those of patients with progressive muscular dystrophy; (2) in every instance pressure exerted by the tongue inside the dental arches was greater than that exerted by the muscles external to the dental arches; and (3) the average spread, in millimeters of mercury, be-

tween tongue pressure and cheek or lip pressure was greater in patients with progressive muscular dystrophy than in normal individuals.

SUMMARY

The effect of myofunctional activity on occlusion has been a subject of discussion for some time. In the present study, which included 7 patients with progressive muscular dystrophy and 20 normal individuals, the measurements of muscular forces that act against the teeth and arches were compared. This may be too small a group from which to draw statistically valid conclusions, but the results have been consistent enough to stimulate further study of such measurements.

The apparatus used mainly determines active voluntary maximum muscular pressure. Whether there is a correlation between the maximum amount of voluntary pressure that muscles can exert and the functional pressures of ordinary muscular activity has not been determined as yet.

Malocclusion of the type that results after full development, or during development, may be the result of muscular dysfunction or overfunction, not only in patients with progressive muscular dystrophy but also in those with postpoliomyelitic paralysis or encephalitis. This may also apply to patients with certain simple lip or tongue habits. Measurements of muscle force correlated with continuing observation of a changing dental occlusion, and with systemic findings, may prove a valuable aid to early diagnosis of some myopathies.

615 West Ninth Street

Labor seeks medical security

Morris Brand, M.D., New York

It is said that future events cast their shadow before them. The event this time is the attempt that is being made to widen the distribution of dental care by utilizing existing programs and facilities such as industrial medical services sponsored by unions and management. The "shadow" in this instance is the recent Work Shop on Dental Care in Industry which was sponsored by the First District Dental Society of the State of New York.

Unfortunately, too little has been done by unions to bring dental services to their members, whereas a number of industrial medical plans have included them. An example of a union medical and dental program is that of the Labor Health Institute in St. Louis; that of the industrial type, the American Cast Iron Pipe Co.; and an example of a third type, the employer-employee sponsored plan is the Consolidated Edison Employees Mutual Aid Society. Some of the programs serve only the workers and others serve the workers and their dependents.

UNMET MEDICAL NEEDS

The problem of unmet medical needs is not new. Many years ago the pioneer

Presented in a symposium before the First District Dental Society of the State of New York, New York City, April 25, 1953.

Medical director, Sidney Hillman Health Center.

developers of this nation's resources learned that their workers in isolated mining, lumber and railroad camps would not remain for any length of time if the services of doctors were not made available to them to treat their ills and accidents. This occurred before the days of unions. As workers banded together to become coherent vocal forces, they sought and obtained a shorter work day and week that would be consistent with man's physical ability and the increase in industrial production, increased wages, workmen's compensation laws, seniority rules in the application of lay-offs, labor-management grievance machinery, abolishment of child labor, and the increasing acceptance of unemployment, disability and old age security insurance benefits.

As complete and partial solutions were found to the more urgent problems, labor began to look to the correction of another group of unmet needs—those of hospital and medical care. Labor learned from personal experience as well as from the many reports regarding the state of the nation's health, that too many of its members and their dependents had suffered unnecessarily—too often because of the lack of adequate medical care. This suffering is due primarily to the financial barriers to such care that still exist for large numbers of people, in addition to the lack of proper medical personnel and facilities. Labor has sought and will continue to seek more and better medical care benefits. Such benefits are no longer considered around the collective bargaining tables as "fringe" items but as necessities in the standard of living, as real as running water, sanitary sewage disposal, bathtubs and other public health measures.

SOCIAL WELFARE BENEFITS

In this nation of 155 million people, over 16 million workers are unionized. If it is estimated that there is one dependent per worker, it can be said that a total of 32 million people are affected each time organized labor makes gains at the collective bargaining tables. Today about eight million workers are covered by some kind of negotiated social welfare benefits.[1] A recent report[2] by Senator Lehman's Committee on Labor and Public Welfare stated that about 50 per cent of the population had some form of medical insurance and of this, only 3 to 4 per cent have comprehensive types of coverage. Fifteen per cent have hospital insurance coverage only, 21 per cent have both hospital and surgical insurance, and only 11 per cent have hospital and surgical with limited medical coverage. Since most voluntary insurance plans provide only partial coverage or partial indemnity for the total medical expenses, the "protected" patients, on the average, are required to pay about 50 per cent of the medical bills incurred for the "protected" conditions. Labor, therefore, wishes to have direct service programs to provide the medical care on a service basis, without hidden costs.

Since it is known that the day-to-day care of health is accomplished best by periodic preventive health examinations, plus the ready availability of professional skills to provide early diagnosis and therapy, labor wishes coverage not only for the so-called catastrophic illness, but also for day-to-day care which too often is as severe a drain on a family's savings as is the dramatic surgical event. Both the A.F. of L. and the C.I.O., therefore, seek a medical insurance program which would provide comprehensive medical service.

Since about 75 per cent of the medical services required by a family are needed by the wife and children, labor wishes

1. U. S. Department of Labor Bulletin, No. 1017. Washington, D. C., U. S. Government Printing Office.
2. Committee on Labor and Public Welfare, U. S. Senate. Health insurance plans in the United States. Washington, D. C., U. S. Government Printing Office, 1951.

to provide coverage for the dependents also. Comprehensive coverage will benefit both labor and management through a decrease in number and severity of illnesses, complications and catastrophic conditions, and through a reduction in absenteeism because of illness with its concomitant wage and savings losses as well as debts for medical bills. Life spans will increase. Families will have greater medical security and a better opportunity for a pleasanter, happier social life.

Labor sees the unmet needs and the vast potential and still untapped reservoir of excellent knowledge and skills in the medical profession and wishes to bring the two together. To have it otherwise, as it is today, is a waste of physicians' capabilities and also of human lives and resources.

In the presentation of labor's point of view, management should not be slighted. It can be said as a general comment that employers have seen the value of medical plans for their workers and for themselves. Industry acknowledges that it is a good business practice to provide maintenance, repairs and preventive services for their workers, as well as for their equipment and buildings. The worker is a good investment at all times. The cost of providing medical service, industrial and nonindustrial, is offset by the lessened demand on community resources and consequent decrease in costs to the community.

Current surveys corroborate the statement that on the average four and a half days per employee per year are lost from work because of toothaches or other dental ailments. "An industrial manager should have only to consider such figures to see that a dental care program can save the plant money by reducing absenteeism."[3]

HEALTH PROGRAMS OF UNIONS

In the absence of a positive nation-wide health program, labor is seeking ways and means to bring to its members and dependents more and better medical services. Examples of direct action in this field by labor unions are the Sidney Hillman Health Centers of New York and Philadelphia, the International Ladies Garment Workers Union Health Center in New York and many other ILGWU units located in many cities, the United Auto Workers-C.I.O. diagnostic centers in Toledo and Detroit, the United Mine Workers medical care program, and the Labor Health Institute (A.F. of L.) in St. Louis. The Laundry Workers branch of the Amalgamated Clothing Workers in New York and the Chicago Joint Board of the Amalgamated Clothing Workers are building medical centers for their members and their dependents. To the extent feasible and in accordance with available funds, some unions will move in the same direction and others will purchase existing voluntary nonprofit or commercial insurance coverage. Labor remains restive as long as it has objectives to attain toward a higher standard of living. Jacob Potofsky, general president of the Amalgamated Clothing Workers of America stated:

> Our social insurance program, of which the Sidney Hillman Health Center is a part, is evidence of our concern over the hazards of illness and old age. We are determined to extend and expand these security measures until they provide the fullest possible protection.

UNMET DENTAL NEEDS

Up to this point nothing seems to have been mentioned about dental care. This is not an oversight, for actually this necessary specialty is incorporated in the term "comprehensive medical services" as used earlier. Unfortunately, too often the oral cavity is treated by physicians and dentists as a thing apart from the rest of the body.

3. Aston, E. R. Responsibility of the Association. Pub. Health Rep. 67:694 July 1952.

The Magnuson report indicated the huge need for dental services. It was shocking to read in that report that

> . . . unless adequate preventive and control measures are applied, the children of today will lose half of their natural teeth by the age of 40 years . . . there is reason to believe that less than 30 per cent of the population receives an adequate level of dental care.

One of the major reasons for the unmet needs in dental care is the shortage and uneven distribution of dentists, dental hygienists and assistants. A few more statements in the Magnuson report can be cited:

> Dental educators estimate that their schools would have to graduate a minimum of 400 more dentists per year than now simply to keep pace with population growth . . . conservative estimates of the need for dentists by 1960 (about another 50,000) indicate a very great shortage.

More interesting was the conclusion that:

> The present shortages will undoubtedly become greater with more widespread dental education.
>
> The number of dentists expected to be practicing in 1960 could probably make use of 150,000 dental assistants and 20,000 dental hygienists. Only about 55,000 dental assistants and 6,000 dental hygienists are working today, but since the training period for these workers is relatively short, the output could be stepped up appreciably.

Even if the estimates and comments as presented are only 50 per cent accurate, the state of this nation's dental health is something that demands positive corrective action. This may require development of experimental dental programs to determine actuarial values so that eventually dental care will be included in prepayment medical care insurance programs. An example of a pilot project at this time is that conducted by Group Health Cooperative in Washington, D. C. A comprehensive program such as that of the Health Insurance Plan of Greater New York (HIP) may obtain the cooperation of one of its many medical groups and establish a comprehensive dental service on an experimental basis. This service may be financed by one or more foundations in order to learn the need and costs of dental care in an insured population which includes adults and children.

Another step that should be given serious consideration by the dental profession to correct this situation is the establishment of dental group practice units. These units will permit not only the better utilization of the knowledge and skills of the dentists but also the wider and more efficient use of dental hygienists and assistants.

It was heartening to read in Volume 5 of the Magnuson report the statements made by responsible leaders in the dental profession, and to discover that they are aware of the unmet needs and are seeking positive ways and means to correct the situation.

DENTAL CARE IN UNION HEALTH PROGRAMS

The following is only a brief outline of the attempts labor has made to bring dental care to its members. Klem and McKeiver of the Department of Health, Education and Welfare stated that "to date dental services are seldom included in such [union] programs." The ILGWU Union Health Center in New York City provided dental care for about 12 years. They had 22 chairs and gave 100,000 services per year, but in 1937 discontinued this service. The Sidney Hillman Health Center and the New York Hotel Trades Council and Hotel Association Health Center in New York City, although permitted by their charters to provide dental examinations, have not instituted this minimal service. There is the possibility, however, that the Sidney Hillman Health Center will consider provision of dental services to the children of members if eligibility for medical care is

extended to them. The Sidney Hillman Health Center in Philadelphia has included a dental examination service only as part of a complete medical evaluation. The Chicago Joint Board of the Amalgamated Clothing Workers of America has maintained an office where dental services are provided at cost. The cost is determined by the dentist in charge.

There is one example which should become the guide for all other union medical programs—that is the Labor Health Institute in St. Louis, the A.F. of L. Teamsters Union project. Comprehensive dental service, except orthodontic care, is provided to over 14,000 members at no additional cost except for artificial dentures which are furnished on a cost basis and which cost a maximum of $65 for complete dentures. All new Labor Health Institute patients receive dental, including full mouth roentgenographic, examinations as part of the physical examination. After the initial examination, the patient is assigned to a member of the dental staff who acts as that patient's personal dentist. Dental and other medical sections exchange information and have frequent consultations when needed. Information on dental services is included in the patient's general medical record. Thus there is a complete integration of all medical services.

In 1952, the Labor Health Institute had close to 18,000 dental patient visits, two visits per dental patient at a cost of $4.95 per dental visit or about $10 per dental patient. These services required about 10,000 dentist hours plus the time of six full-time dental assistants.

POSSIBLE SOLUTION

In the face of the many fears expressed by authorities on the provision of dental care and costs on a prepayment basis, it is not surprising that voluntary nonprofit dental insurance programs have not been established and that more labor medical centers have not included dental care in their services.

Labor and management must not consider dental care as an entity isolated from other medical needs. They must be aware that unmet dental needs are part of the total unmet medical needs and should be included in their programs for medical services provided employees and their families.

Edward R. Aston, secretary of the American Association of Industrial Dentists, stated:

> **Cooperation with labor organizations has been suggested as an approach to the problem of establishing industrial dental health programs. Since we are confronted with the fact that in many instances these groups are setting up their own health services, would it not be advisable for this association to cooperate in planning the programs so that they will organize the type of program we know to be most practical?**

The attack on this problem, focused at the worker's level and using existing organized medical services, is well conceived and should in all probability bring the quickest practical solution to a large group of employees and their dependents.

Man's Stability • **Our stability is but balance, and our wisdom lies in masterful administration of the unforeseen. *Robert Bridges.***

COUNCIL ON DENTAL HEALTH

Conference on industrial dentistry

A conference on industrial dentistry was conducted on May 18 as a feature of the first 1954 meeting of the Council on Dental Health. Participants were members of the Council and representatives of the American Association of Industrial Dentists and the Industrial Medical Association.

David W. Brock, Council chairman, presided and explained that the purpose of the conference was to obtain from those associated with industrial health programs knowledge, technics and workable ideas that might help the Council provide greater and more specific assistance to dental societies in improving occupational dental health programs.

JUSTIFICATIONS FOR DENTAL PROGRAMS IN INDUSTRY

In discussing "Justifications for Dental Programs in Industry," Ira Dow Beebe, chairman of the Council's Committee on Industrial Dental Programs cited four major considerations for occupational health programs: (1) the opportunity provided by industry for dental health education of an organized adult group; (2) the effect of dental involvements on absenteeism which lessens production; (3) the savings in dollars and cents to management through a preventive program, and (4) the need for dentistry to be represented in general health programs in industry.

Discussion • Studies are needed to demonstrate the value of industrial dental health programs in reducing absenteeism and in contributing to efficiency and economy. Some studies have been made to show the amount of time lost through absence but few studies show the specific amount resulting from dental causes.

Provision for medical care for occupational illnesses and injuries is established by law on the basis that the employer is responsible. Only 14 states specify responsibility for dental defects. Furthermore, medical illnesses are more dramatic and, consequently, easier to demonstrate than are dental illnesses. However, dental health is an important part of general health and should be a part of the over-all health program. For example, inefficiency because of dental illness was demonstrated by one instance in which a man with a toothache ruined a die costing $700.

The dental profession can and should contribute to the efficiency of the employee by cooperating with the employer in a preventive, education program.

DENTAL PROGRAMS IN SMALL PLANTS

A paper on "How Dental Programs Can Be Organized and Conducted in Small Plants," prepared by Edward R. Aston, was read by Harry Dougherty. Both dentists were named as representatives of the

American Association of Industrial Dentists; however, Dr. Aston was unable to attend the conference.

Dr. Aston defined a small plant as one having no more than 100 employees and said the field of small plant programs would concern about four million industries. He cited a recent United States Department of Commerce survey which showed that out of a possible 4,450,000 business firms in the United States, only 351,000 had an employee population of over 100. The total number of persons in industry to be considered is over 60 million, he said, in addition to those at home.

In Dr. Aston's opinion, where there is a medical and a nursing program, it is much easier to institute a dental program, for if management wishes to provide a complete health program for its employees, dentistry must be included. He outlined three small plant dental programs. The most acceptable, he believed, was one in which several plants cooperate in maintaining a common dental unit for all the employees, and prorate the expense. The dentist engaged to direct the program could be employed either on a full-time or a part-time basis. Dr. Aston explained that the success of this type of program depends on obtaining the approval of management in each industry concerned and on establishing the mechanics of setting up the program.

Dr. Aston stated that, contrary to the opinion held by many dentists, few industries are interested in a dental program. Such programs, he said, need the leadership of the local dentists who should follow the principles outlined by the American Dental Association. He suggested two methods to stimulate interest in industrial dental programs: (1) discussions by private practitioners with their industrial top management patients about the value of such programs and (2) the conduct of demonstration programs and surveys. Industry must be convinced of the need for a dental program, he emphasized, not only from a health standpoint but on a dollar-and-cents basis.

Discussion • An occupational dental health program must be a preventive, not a corrective program. One of the most effective arguments for establishing such a program is not that it costs money but that it saves money; however, the advantages in dollars and cents must be demonstrated. Specific data are essential, but gathering statistics costs money.

Dentistry has been a part of the Wyomissing, Pa., health program since 1916, and an estimated 75 per cent of its 8,200 employees are presently participating.

The program follows the principles advocated by the A.D.A.[1] and the A.A.-I.D.: preplacement examination, including roentgenograms; emergency service, including treatment for accidental injuries and diseases of an occupational nature; maintenance of dental records; dental health education, and referral to private practitioner for treatment.

EDUCATIONAL AIDS FOR INDUSTRIAL DENTAL PROGRAMS

In introducing the subject of "The Development of Educational Aids for Industrial Dental Programs," Francis Walters of the A.A.I.D. described a study program, the purpose of which is to stimulate the individual to do something for himself. Small industries were selected for the two-year study which is currently in progress.

Motivating devices, such as flip charts, notices in pay envelopes and meetings of supervisors, are utilized to encourage the employees to respond to the opportunity for dental examinations. At first, bitewing examinations were provided, but Dr. Walters said they had to be dispensed

1. American Dental Association, Council on Dental Health. Official policies of the American Dental Association on dental health programs. Chicago, American Dental Association, 1954, p. 52.

with because the patients were of the opinion that this type of roentgenogram was all that was needed.

The study has demonstrated also the need for more dental health education materials in the industrial field as well as indication of the characteristics such materials should have. Group counseling has been found to be the most difficult part of the study project to carry out, Dr. Walters reported. He hoped that meetings for the presentation of health talks would be planned and that the company's house organ would be used to reach employees with a dental health message.

Discussion • The program described has been a great source of dental health education as information given the employee filters down to his family, thus bringing about an improvement in the dental health of the children.

Two possibilities were suggested for the establishment of small plant dental programs: (1) inspection and education programs conducted by local health departments and (2) inspection programs conducted by dental societies on a voluntary basis or on a basis which would enable the participating dentists to receive some remuneration from the plant management. The need for dental health education materials for use in industry is great, but some participants believed that the dental profession must create a demand for them. Industry is accustomed to using free commercially-sponsored health education materials.

ROLE OF DENTAL SOCIETIES IN INDUSTRIAL DENTAL PROGRAMS

Describing "The Role of Dental Societies in Industrial Dental Programs," Charles Crowe, member of the Council on Dental Health, said that in the past, industrial dental programs generally had been neglected by dental societies, and, as a result, the dental profession had little or no control over them. Fortunately, he explained, most industrial clinics, because of the caliber of the dentists associated with them, have been conducted in a very satisfactory manner.

Dr. Crowe stressed the importance of state legislation that would safeguard high standards for industrial dental programs, and that the dental society should initiate and sponsor such legislation.

The potential of industrial dental programs has not been explored to its fullest, Dr. Crowe noted, and dental societies should inform their members of the importance of such programs on dental health education. Dr. Crowe believes that meetings similar to those conducted by the Council on Dental Health with representatives of management and labor should be conducted at the state level.

Discussion • The appointment of committees on industrial dentistry by local dental societies stimulates interest among other members of the society and helps inform the dental profession regarding this increasingly important field.

Preventive and emergency health programs have not necessarily stimulated labor to request more welfare services from management, but increased demands for fringe benefits in the form of health services may be expected in the future.

Small plants will not spend money on dental health education materials but they will on materials dealing with safety. The Council on Dental Health receives requests for free education materials only. The actual amount of worth-while free dental health education materials available, however, is negligible. If there were some assurance that such material would be purchased, it would be developed by the Council's Division of Dental Health Education.

The committee on health and safety of the National Association of Manufacturers is much concerned with health programs for small plants and is trying to

develop programs that could include dental health. Dental hygienists also are interested in industrial dental health programs. There is a possibility also of creating interest in programs for small plants through local health departments. The difficulty in these cases is that many small health departments have no staff dentists.

The term "occupational health" is gradually gaining preference over "industrial health" in that the former is more inclusive.

COOPERATION OF DENTAL AND MEDICAL PROFESSIONS

Alfred Whittaker of the Industrial Medical Association suggested closer liaison between the dental profession and the medical profession so as to bring about the inclusion of dentistry in industrial health programs. Specifically, he outlined working arrangements between dental societies and their counterparts in the medical field.

The Industrial Medical Association, Dr. Whittaker explained, was founded in 1916 and comprises some 2,000 medical directors. The organization also has state and local societies. In addition, the American Medical Association has established a Council on Industrial Health to study problems in industry, especially those relating to legislation. The state and county medical societies have similar committees.

Dr. Whittaker also recommended refresher courses in industrial dentistry for dentists in private practice. He said that the A.M.A. provides such courses for general practitioners located in industrial areas. As the general practitioner gains a better understanding of industrial medicine, he provides a better service for the industrial employee.

CONCLUSION

The conference concluded that there is a tremendous potential for dental health education of adults through industrial dental health programs and that the development of such programs should be under the active leadership and promotion of the dental profession. This leadership can be enhanced considerably by specific supporting data showing the value of industrial dental health activities. Such data can be obtained through study and demonstration programs. Health departments can assist in the conduct of such studies and demonstrations. The dental profession has formulated certain basic principles for the establishment and maintenance of industrial dental health programs; the profession now should assume more leadership in seeing that such programs are established.

COUNCIL ON DENTAL THERAPEUTICS

Council announces classification of additional products

The classification of products by the Council on Dental Therapeutics has been described in a previous report (J.A.D.A. 40:489 April 1950). The Council's program now provides for classification of products in Group A, Group B, Group C and Group D. Products are reconsidered periodically, and decisions are subject to change at any time that a substantial amount of new evidence becomes available. The files of the Council contain information on many drugs and dental cosmetics, and inquiries are welcome.

GROUP A

Listing of products in Group A means that at the time of their consideration, the items conformed with the provisions for acceptance established by the Council on Dental Therapeutics and adopted by the Board of Trustees and the House of Delegates of the American Dental Association. Items in this group will be listed in *Accepted Dental Remedies* and may use the Seal of Acceptance, unless otherwise provided.

The following additional products are classified in Group A:

Procaine HCl 2%, Tetracaine HCl 0.15%, Phenylephrine HCl 1:2,500 (See A.D.R. ed. 19, pages 24, 34, 93)

Procaine HCl 2%, Tetracaine HCl 0.15%, Phenylephrine HCl 1:2,500 (Neo-Quest Chemical Co., Inc.): Each cc. is stated to contain procaine HCl, 0.02 Gm.; tetracaine HCl, 0.0015 Gm.; phenylephrine HCl, 0.0004 Gm.; sodium chloride, 0.0045 Gm.; sodium bisulfite, 0.002 Gm.; methylparaben, 0.001 Gm.; in distilled water. Marketed in 2.2 cc. cartridges.

Procaine HCl 2%, Tetracaine HCl 0.15%, Phenylephrine HCl 1:2,500 (The William A. Webster Co.): Each cc. is stated to contain procaine HCl, 0.02 Gm.; tetracaine HCl, 0.0015 Gm.; phenylephrine HCl, 0.0004 Gm.; sodium chloride, 0.0045 Gm.; sodium bisulfite, 0.002 Gm.; methylparaben, 0.001 Gm.; in distilled water. Marketed in 2.2 cc. cartridges.

GROUP B

Listing of products in Group B means that there is insufficient evidence to justify their present acceptance, but there is reasonable evidence of their usefulness and safety. These products meet the other qualifications and standards established by the Council on Dental Therapeutics. It is the Council's opinion that Group B products may be promoted for special use and study.

The Council's initial consideration of products which may be eligible for Group B listing is influenced favorably by the knowledge of further investigations then in progress. It is the policy of the Council to reconsider Group B products each year on the basis of new evidence which may be produced in their support. Classification in this category is not ordinarily continued for more than three years.

GROUP C

Listing of products in Group C means that the evidence is so limited or inconclusive that the products cannot be evaluated accurately. It is the Council's opinion that Group C products require further study by qualified investigators.

GROUP D

Listing of products in Group D means that they are unacceptable because of their demonstrated inability to meet the standards outlined in the provisions for acceptance.

BUREAU OF LIBRARY AND INDEXING SERVICE

The American Dental Association Film Library

The following films have been added to the American Dental Association Film Library and are now available at a nominal rental fee of $2.50 to dental societies, study clubs, dental schools, hospital dental staffs, and armed services dental personnel. Reviews of these films will appear in subsequent issues of THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION.

FILMS RECEIVED

Articulatory Movements in the Production of English Speech Sounds. Part I—"Consonants" • 16 mm., color, sound, 25 min. Produced in 1953 by the Veterans Administration. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago, and from the Central Film Library, Veterans Administration, Vermont Ave. & H. Street, N.W., Washington 25, D. C. Purchase from United World Films, Inc., 1445 Park Ave., New York.

This film demonstrates the articulation of English speech sounds through the use of animated drawings of the breathing process and through close-ups of the laryngeal and articulatory structures of a patient in a Veterans Administration hospital who has undergone extensive surgery for a chondrosarcoma. (Suitable for hospital dental staffs, general practitioners, prosthodontists, armed service personnel and dental students.)

Dental Prophylaxis • 16 mm., color, magnetic sound, 22 minutes. Produced in 1953 by the University of Minnesota School of Dentistry. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago 11, and also on loan from the University of Minnesota School of Dentistry, Minneapolis. Write to the producer for purchase arrangements.

This film demonstrates an established dental prophylactic technic which includes the following steps: instrumentation, polishing, transillumination and patient instruction. (Suitable for dental students, general practitioners, dental hygienists and nonprofessional groups.

Equilibration of Occlusion • 16 mm., color, sound, 720 feet, 20 min. Produced in 1952 by the Department of the Navy, Bureau of Medicine and Surgery, Washington 25, D. C. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago, and from the Department of the Navy. Purchase from United World Films, Inc., 1445 Park Ave., New York.

This film, intended to be used as an introduction to the problems of occlusal equilibration, illustrates the fundamentals of occlusal equilibration by means of animated drawings and live action. The mechanism and dangers of traumatic occlusion, the general principles of diagnosis and the planning of therapeutic measures are also shown. (Suitable for armed service personnel, dental students, general practitioners, prosthodontists and hospital dental staffs.)

General Anesthesia • 16 mm., color, silent, approximately 30 min. Produced in 1953 by the Department of Visual Education, School of Medicine and Dentistry, University of Louisville, Louisville, Ky., with Richard Herd, D.D.S. and Robert Bergner, M.D., as collaborators. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago, and from the producers.

This film, through live action, demonstrates the administration of various anesthetic agents such as nitrous oxide oxygen, thiopental sodium, thiopental sodium and nitrous oxide, vinyl ether and vinyl ether with nitrous oxide. (Suitable for dental students, general practitioners, oral surgeons, hospital dental staffs and armed service personnel.)

Preparation of Biopsy Specimen • 16 mm., color, magnetic sound, 600 ft., 20 min. Produced in 1953 by the University of Minnesota School of Dentistry. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago, and from the producer. For purchase arrangements write to the University of Minnesota School of Dentistry, Minneapolis.

This is a sequel to the film, "Principles of Biopsy," which is also available from the Film

Library. It illustrates the laboratory technics used to prepare two biopsy specimens for diagnosis. Fixation, dehydration, embedding, cutting, and staining of the tissues are shown. Cinephotomicrography illustrates the microscopic findings of a benign and a malignant lesion. (Suitable for dental students, oral surgeons, hospital dental staffs and armed service personnel.)

Brushing Your Teeth • 16 mm., color, sound, 5 min. Produced in 1952 by the Realist Film Unit for the Dental Board of the United Kingdom. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago. Purchase from the Dental Board of the United Kingdom, 44 Hallam St., London, W.1, England.

This short film shows Marian, the dental student in the British film, "Thirty-Two of Her Own," demonstrating the correct method of brushing teeth. This film may be used separately or it may accompany the film, "Thirty-Two of Her Own." (Suitable for grade school, high school, community and civic groups.)

Thirty-Two of Her Own • 16 mm., color, sound, 889 ft., 22 min. Produced by the Realist Film Unit for the Dental Board of the United Kingdom, London, England. Procurable on loan ($2.50) from the American Dental Association Film Library, 222 E. Superior St., Chicago. Purchase from the Dental Board of the United Kingdom, 44 Hallam St., London, W.1, England.

This film shows Marian, a female dental student, at various stages in her training up to the time when she qualifies as a dental surgeon and is seen giving instruction in oral hygiene to some of her young patients. (Suitable for dental hygienists, dental societies, senior high school and college students and nonprofessional groups.)

COUNCIL ON DENTAL RESEARCH

Addition to List of Certified Dental Materials

Since the publication of the most recently revised List of Certified Dental Materials (revised to November 15, 1953), the following material which conforms to the Specification No. 6 for Dental Mercury has been added.

CERTIFIED DENTAL MERCURIES
(A.D.A. SPECIFICATION NO. 6)

Mercury	*Manufacturer or distributor*
Merck Redistilled N.F.	Merck & Co., Inc.

JUDICIAL COUNCIL

Ethics

The Judicial Council of the American Dental Association here reports an opinion regarding the ethical announcement of a change of address. Names have been removed, as well as other parts of the inquiry which would identify persons associated with the case. The question raised in this letter is covered by the *Principles of Ethics* of the American Dental Association, copies of which may be secured by writing to the Central Office of the Asso ciation.

ASSUMING ANOTHER'S PRACTICE

Question • Please advise me about announcing to my patients the removal of my office to another location.

I have purchased equipment formerly used by a local dentist who died some months ago. I now occupy his offices and have his complete mailing list. I would like to write to his patients, as well as my own. Would you suggest using the same form for both?

D.D.S.

Reply • We would suggest a separate notice going to your own patients of record informing them of your change in office location. See Section 15, "Announcements," of the enclosed *Principles of Ethics.*

As to the notice to be sent to the other dentist's patients of record, we would suggest a notice somewhat as follows:

Dr. ———— wishes to announce that he is assuming the practice of the late Dr. ———— at his former location, Room 300, Medical-Dental Building, ————.

You could add your telephone number and office hours if you like.

Judicial Council

ANNOUNCEMENT OF NEW PRACTICE

Question • Is it ethical for a dentist who has never practiced before to send cards announcing the opening of his office to people in the vicinity or to membership lists of organizations of which he is a member?

Reply • This action would be in direct violation of Sections 13 and 15 of the Association's *Principles of Ethics.* Note especially the wording of the second sentence of Section 15 which reads, "Such announcements may be sent only to dentists, members of other health professions or to patients of record."

Judicial Council

LON W. MORREY, D.D.S., EDITOR

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THE Journal OF THE AMERICAN DENTAL ASSOCIATION

Editorials

The issue of OASI

The recent action of the Congress in excluding dentists from the Old Age and Survivors Insurance provisions of the federal Social Security Act has again brought this issue into current discussion. There is reason to believe that this issue will be kept alive by further efforts to extend coverage to all self-employed or, alternatively, to devise some program for elective coverage.

There is no doubt that there are strong opinions in the dental profession on both sides of this question. Such debate is helpful so that eventually opinions may crystallize into the policy which the Association presents to the Congress in behalf of a majority of dentists.

The member with strong opinions on this topic has an immediate opportunity and duty to himself, his Association and his profession. He must convey his opinions to those who will represent him in the legislative body of the Association, the House of Delegates, which meets in Miami in November. Incidentally, this is a much more effective method of gaining his point than is the writing of letters-to-the-editors of throwaway dental publications after he has carelessly or willfully neglected to make use of the democratic process that is so readily at hand.

The member who defaults in this matter has no right later to complain about his lack of participation in any decisions that are made. The member who defaults in telling his representative what he thinks also defaults as an advocate of the democratic process. He strengthens those who seek evidence of disunity in a health profession. He gives comfort to those many who would impair the right of a voluntary association to speak with a strong voice for a majority of its members in matters that are of national interest and concern.

Accident and health insurance program receives approval of Association members

The accomplishment of a difficult task always gives a sense of satisfaction. At the moment the members of the Council on Insurance are experiencing that sensation—and rightly so—as they have just completed what, at times last spring, seemed to be almost an impossible undertaking—the enrollment of fifty per cent of the Association's membership in the Association's accident and health insurance program.

On September 15, the terminal date for the second enrollment period for the program, the Council announced that it had secured an excess of 700 applications over the number required to meet its national quota. This means that the thousands of applicants who, because of an unfavorable physical condition, have heretofore not been able to obtain such insurance, now are protected. A news story on the program is published on page 475 of this issue.

On behalf of the members of the Association, and particularly on behalf of those members who are considered special risks, THE JOURNAL congratulates the Council on Insurance for sticking to its purpose and for reaching its goal in spite of what at times seemed insurmountable obstacles. Nor must congratulations stop with the Council on Insurance. The officers, committeemen and trustee of the program and others in the many constituent and component societies who labored in behalf of the program are to be both congratulated and praised for their efforts. It is to these persons that several thousand members, whose names will forever remain unknown, are indebted for making this insurance protection possible.

The American Dental Directory enter orders now

Dentists are not the firmly anchored citizens they long were thought to be according to information recently compiled by the membership department of the Association for the 1955 edition of the *American Dental Directory*. Approximately twenty-five thousand addresses for the country's ninety thousand dentists have been tabulated since the 1954 edition of the *Directory* was published—a moving rate of twenty-eight per cent. It is no easy task for the membership department to keep abreast of this high rate of movement, but it does so with a surprising degree of accuracy. Providing such a list is one of the major objects of the annual dental directory and one most appreciated by members and others concerned with the dental profession.

Most dentist subscribers report that the *Directory* is an indispensable accessory in their office as it supplies them instantly and easily with the names and addresses of general practitioners and specialists in other communities to whom they may refer

patients. Others value it for more personal and less practical reasons—among other things, to locate old friends, old classmates and old fellow dental officers.

The 1955 *Directory*, like earlier issues, lists the names of the nation's dentists, both alphabetically and geographically. It provides essential information about each dentist listed, such as the year of his graduation, the school from which he was graduated, the character of his practice, and his affiliation with the Association.

Additionally, the *Directory* lists the names and locations of the dental schools and schools for dental auxiliaries. It lists the names and addresses of key personnel in each state, requirements of state dental examining boards, information regarding the National Board of Dental Examiners, and the names and addresses of dental specialists.

Regular subscribers to the *Directory* will welcome this opportunity to enter an early order for the 1955 edition. Those who are unacquainted with its usefulness are urged to join the growing list of users. Subscriptions received prior to October 15 cost but $6.00. Later subscriptions cost $7.50. An order blank is printed on page A-39 of this issue.

Health Career Horizons—
prospect of an expanding dentistry

Dentists will join with members of other health professions in watching with interest the progress of a health education program recently announced by the National Health Council. Termed Operation Health Career Horizons, the program is designed to broaden the high school student's concept of all matters pertaining to health and to increase the recruitment of American youth in the various branches of the health professions so as to provide more fully the health services the people need, demand and are willing to pay for.

Operation Health Career Horizons is getting off to a good start. It is keyed to a perfect audience—the seven million young men and women in America's twenty-six thousand secondary schools. It has ample financial backing—funds supplied by one of the nation's largest insurance companies. And it has the interest and cooperation of the leaders of the country's health, education and vocational guidance groups. With such an object, such financial backing and such cooperation, the project, with proper guidance, is slated for certain success.

Dentists are among those that not only wish the program well but will work to make it succeed. In fact, the National Health Council's program, coming at this time, is particularly welcomed by the dental profession as it can be used to supplement the educational programs which, for several years past, have been conducted by the Council on Dental Health and the Council on Dental Education of the American Dental Association. Also, the Association's public educational program, particularly its vocational guidance program, would seem to be custom-built for the purposes of the National Health Council.

The experience of the Association, particularly the experience of its Council on Dental Education, in student recruitment, can be used to good advantage by those in charge of the new program of the National Health Council. Experience dictates that although it is important that the quantity of dental student applicants be maintained at high level, it also is essential that the quality of the applicants be of the highest order. The vocational guidance program conducted so successfully by the Council on Dental Education for the past several years has stressed both objectives—quantity and quality—equally. Annually the Council provides America's 1,400 colleges and universities with more than 50,000 brochures describing the Association's aptitude testing program. Undoubtedly this informational project has aided materially to motivate more young men and women to seek dentistry as a career. With the increase in the quantity of dental student applicants came about a corresponding increase in their quality—a circumstance brought about largely by the Council on Dental Education through its aptitude testing program which is embraced by all 43 dental schools in the country. Whereas formerly it was not uncommon for many dental schools to experience a twenty-five per cent mortality among their students, that rate has dropped to approximately eight per cent since the adoption of the aptitude testing program.

For the past decade America's dental schools have received far more applicants than they could accommodate. During the immediate postwar period the number of applicants rose to 13,000—more than four times the number of freshman spaces available. As the number of eligible veterans decreased, applications dropped, reaching a low of about 6,000 in 1952. During the past two years the number of applicants has increased again, and it is estimated that more than 7,000 students will seek admission to the 3,300 openings in the country's 43 dental schools next year.

Despite the relatively favorable position occupied by the dental student recruitment program, there is always room for improvement. And dentistry looks to Operation Health Career Horizons to help bring that improvement about. Because of dentistry's experience in programs of this kind it has much to offer those in charge of the National Health Council's project not the least of which, perhaps, is this advice: do not build quantity at the expense of quality. Major battles are not won by rag-tag armies.

Washington News Letter

Although the 83rd Congress of 1953-54 passed relatively little legislation of direct interest or application to the dental profession, it may be a different story next year. Indeed, all signs are indicative of considerable activity in national health legislation after the new Congress convenes in January, with dental affairs occupying a prominent position.

For example, with White House support, the Department of Defense will press for enactment of a bill delineating government responsibility in the matter of health services for military dependents. Dental and medical care would be involved, as well as hospitalization. Such care might be provided by civilian practitioners on a fee basis, as well as by uniformed personnel.

Another step to which the Administration is committed is the provision of contributory health insurance coverage for the more than 2,000,000 employees of the federal government. Since the plan is for each government agency to work out its own schedule of benefits, dental care coverage may be included in those areas of the country where this new type of prepaid insurance is available.

President Eisenhower and the Department of Health, Education and Welfare likewise have given notice that they will make another attempt in 1955 to gain enactment of federal reinsurance. Unlike dependents' care and federal employees' health insurance, which were introduced in Congress but got no further, the reinsurance plan came fairly close to passage this year. Should it make the grade in the 84th Congress, its importance to dentistry would depend on the growth and development of prepaid dental care insurance, which is still in its infancy.

More in question are a number of other important matters. These concern the administration and scope of the federal dental services; the future of government grants-in-aid to the states and educational institutions for dental research and dental public health, and measures which may be taken to insure adequate dental care for members of the Armed Forces on termination of the so-called doctor-draft act in July 1955.

HOOVER COMMISSION

Within the next several months, Congress will receive findings and recommendations of the Hoover Commission and the Intergovernmental Commission on Government Relations. To implement these reports, legislation and reorganization plans undoubtedly will be taken up in Congress. The ultimate results will have a vital bearing on the diversified dental operations under government auspices—how they shall be administered; which ones ought to be expanded, curtailed or terminated; coordination of activity with nongovernmental dental operations, and so on.

The Department of Defense has no intention, at this stage, of asking Congress for another extension of the doctor-draft law. However, it is expected to call for continuation of the regular draft in 1955. At the same time, the Department of Defense probably will propose a plan providing for a systematic culling of dentists and physicians subject to induction under the regular draft, so that the timing and the numbers taken would be most suitable for the requirements of the Armed Forces.

That hardy perennial, outpatient dental care benefits for veterans, unquestionably will get another working-over on Capitol Hill in the new Congress. Permanent legislation designed to put a brake on this multimillion dollar activity

of the Veterans Administration, the greater portion of which is handled by private practitioners on a fee basis, just failed of enactment this year.

A special committee of the National Dental Research Advisory Council, charged with responsibility of uncovering the neglected areas of dental research, held its first meeting in September. Its initial progress report will be presented at the Council's regular fall meeting October 18 and 19.

Three members of the Council and two members of its consultative study section comprise the committee. Chairman is T. J. Hill, School of Dentistry, Western Reserve University. Other members are Wallace Armstrong, M.D., University of Minnesota; Arnold Nicholson, editor of the magazine *Country Gentleman;* Wendell Wylie, College of Dentistry, University of California, and Seymour Kreshover, School of Dentistry, Medical College of Virginia.

The five member group was set up by the Council to make a thorough study of private and governmental dental research throughout the nation and to prepare a report that would serve as a guideline for future federal assistance and planning of future intramural research programs of the National Institute of Dental Research.

INSTITUTE OF DENTAL RESEARCH

With reference to the NIDR, it is the only component of National Institutes of Health to which no beds have been assigned in the NIH 500-bed Clinical Center, opened in July of last year. There is a strong possibility that the Institute will request operating funds for a small number of research beds in the Clinical Center for the fiscal year beginning July 1, 1955.

At the Dental Research Advisory Council meeting in October, three new members will be seated. At press time, two of them had accepted appointment: Maurice J. Hickey, associate dean of the School of Dental Surgery, Columbia University, and Jack B. Beardwood, public relations counselor of Los Angeles. The latter formerly served as an assistant to Mrs. Oveta Culp Hobby, Secretary of Health, Education and Welfare.

The three Council members whose terms have expired are Mrs. Mayola S. Center, of Georgia; C. A. Elvehjem, Ph.D., University of Wisconsin, and Carl Sebelius, director of the Division of Dental Health, Tennessee Department of Public Health.

Association Affairs

1,700 DENTISTS NEEDED BY ARMED FORCES BEFORE JULY

Some 1,700 dentists will be needed by the military as replacements before the expiration of the dentist-physician draft law next June 30, chiefs of the Armed Forces dental corps said at a meeting of the Council on Federal Dental Services held September 12 and 13 at the Central Office, under the chairmanship of R. H. Friedrich, Council head. Of the dentists needed, the Army will take about 650, the Air Force 570 and the Navy 480.

Leo J. Schoeny, dentist member of the National Advisory Committee to Selective Service and consultant to the Association Council, said that in order to meet the needs of the Armed Forces, some dentists in Priority III over 32 years of age may be called. Emphasis, however, will be placed on calling men in Priority I and II and recent graduates.

The Army has requested an October draft call for 100 dental officers to be inducted in December and will request a call for 179 in November for January induction and a call in January for 300 for April induction, Maj. Gen. Oscar B. Snyder told the meeting. Navy needs will be satisfied by the 480 graduates of June classes who have signed up for the service, announced Rear Admiral Daniel W. Ryan, chief of the Dental Corps. The Air Force, said Brig. Gen. Marvin E. Kennebeck, has already been allotted 150 men from Selective Service for the last quarter of 1954 and probably will need 200 in April. In addition to the 350 in these two groups, the Air Force will fill its needs from 175 applications for commissions now being processed which have been received from dental school graduates.

Also reported on was the $100 a month special pay for dentists. It was indicated that the Department of Defense will ask Congress to extend incoming officers' eligibility for the special pay beyond June 30, 1955, the scheduled expiration date for gaining entitlement to the special pay.

INSURANCE DRIVE TOPS QUOTA, IMPAIRED RISKS COVERED

The largest association group plan of accident and health insurance ever to be placed in effect on a nation-wide basis by a professional organization began operating September 15. One day earlier, the national quota for the American Dental Association's Health and Accident Insurance Plan was reached, thus making the plan operative for all Association members in active practice who had applied during the enrollment period regardless of their previous medical histories. In the last few days of the enrollment period, several hundred applications were received to bring the total number well over the required 28,500.

Leslie M. FitzGerald, Association president, in commenting on the success of the drive, said, "It is another demonstration of the cooperation and support provided by dentists everywhere for the benefit of all members of the profession."

And Harold Hillenbrand, Association secretary, stated, "In my opinion, the achievement of the qualification of the program was one of the greatest services which the Association has provided for its members in many years."

The insurance program provides accident and health coverage up to $200 a month for impaired risks and up to $400

a month for those dentists who do not have a history of previous illness. In addition, there are dismemberment and accidental death benefits. Until such time as another open enrollment period is announced, applications can be accepted only from Association members in good physical condition, Paul Zillmann, insurance trustee, stated.

COUNCIL SECRETARY, DIVISION DIRECTOR RESIGN POSTS

The resignations of W. Philip Phair, secretary of the Council on Dental Health, and of Cletus J. Cummiskey, director of the Division of Educational Measurements of the Council on Dental Education, were announced September 1 by Harold Hillenbrand, Association secretary.

Dr. Phair, who resigns October 1 to enter private practice, joined the Association staff in 1950 as assistant secretary of the Council on Dental Health. In September 1953 he was appointed Council secretary to succeed Allen O. Gruebbel, who had resigned a few months earlier. Prior to joining the Central Office staff, Dr. Phair was head of the dental hygiene section of the Washington State Health Department.

Mr. Cummiskey, who became director of the Division of Educational Measurements a year ago, will become an assistant professor at Mankato State Teachers College (Minn.), the school at which he took his undergraduate training. Successors to the two men will be announced at a future date.

NOMENCLATURE CONFERENCE TACKLES TROUBLESOME TERMS

General principles for guidance in the selection of terms in the dental vocabulary were proposed and approved by the nomenclature conference held under the sponsorship of the Bureau of Library and Indexing Service at the Central Office September 3 and 4.

During the conference, workshop committees considered such terms as occlusion and articulation, premolar and bicuspid, canine and cuspid, deciduous and primary, prematurity and initial contact. Also discussed were the terms periodontal membrane, fluoridation and fluoridization, caries and carious lesions, restoration and filling. The names of the specialties and branches of dentistry were examined as well.

"The conference did not attempt to make any authoritative pronouncement," stated George B. Denton, Association research consultant who conducted the conference, "but presented facts and information in regard to these terms so that dentists would have the background needed to decide for themselves which terms are appropriate."

During the coming year an educational campaign will be carried on to reach dental educators, authors and editors to enlist their aid in improving dental nomenclature, Dr. Denton stated. A report on the conference will be issued December 1. Persons wishing copies may write to Donald Washburn, director, Bureau of Library and Indexing Service.

HISTORY OF DENTISTRY GROUP LISTS MIAMI SPEAKERS

A tentative program listing speakers and their subjects has been issued by the American Academy of the History of Dentistry for its Miami, Fla., meeting November 5. Papers will be presented on early Charleston, S. C., dentistry, Florida dental history and pioneer oral surgeons in America. In addition, a biographical sketch of Vincenzo Guerini will be given. Among the speakers are L. Laszlo Schwartz, Neill W. Macaulay, Manuel M. Maslansky and Prof. Charles W. Tebeau, chairman of the history department of the University of Miami.

SENATOR KNOWLAND, CONGRESSMAN FROM CALIFORNIA, ACCEPTS INVITATION TO SPEAK AT ANNUAL SESSION

Senator William F. Knowland (R., Calif.) will address the general meeting of the House of Delegates at the annual session November 8-11 in Miami, Fla., Leslie M. FitzGerald, Association president, has announced. Active in state and national political affairs for more than 20 years, Senator Knowland has been majority leader in the U. S. Senate for the past year.

Senator Knowland

He has served as a member of the Senate Committee on Foreign Relations, the Senate Appropriations Committee and the Joint Congressional Committee on Atomic Energy.

RESOLUTIONS

Resolutions have been submitted for consideration by the House of Delegates opposing extension of the special physician-dentist draft law, calling for tax exemption of income used for purchase of a limited amount of annuity insurance, on inclusion of dentists in OASI and on the establishment of a scientific section on anesthesiology.

In addition, councils of the Association are asking for revision of the Association requirements for approval of dental schools, have submitted resolutions on strengthening state dental health programs and on labor union dental care plans. The House of Delegates will act on a revision of policy governing approval of dental health education materials and a program for accreditation of dental laboratories.

A report of the special committee on reorganization of trustee districts outlining seven alternative plans for district representation also will be studied. To date 55 resolutions from constituent societies and councils have been submitted.

ELECTION OF TRUSTEES

Trustees will be elected for the Second, Eleventh, Twelfth and Thirteenth Districts. Trustees whose three year terms are completed are Percy T. Phillips, Clarence S. Renouard, William R. Alstadt and Bernerd C. Kingsbury.

REFERENCE COMMITTEES

Members of three standing and 11 reference committees have been appointed by Leslie M. FitzGerald, Association president. The appointments, with the three standing committees listed first, are:

Constitution and Bylaws • Max E. Ernst, chairman, St. Paul; Jacob Feinman, Staten Island, N. Y.; J. D. O'Farrell, Houston, Texas; E. B. Penn, Miami, Fla., and F. A. Pierson, Lincoln, Neb.

Credentials • Paul W. Zillmann, chairman, Buffalo; O. J. Shaffer, El Paso, Texas, and Eugene J. Dionne, Fall River, Mass.

Rules and Order • H. C. Jarvis, chairman, Cincinnati; Jose M. Gonzalez, San Juan, P. R., and Wilbert Jackson, Clinton, N. C.

Dental Education • Bruce R. Kurtz, chairman, Pasadena, Calif.; William F. Swanson, Pittsburgh, and A. B. Coxwell, Louisville, Ky.

Dental Research and Therapeutics • Edward D. Leifer, Washington, D. C., chairman; E. A. W. Montgomery, Evansville, Ind., and E. D. Suggett, Jefferson City, Mo.

Federal Dental Services • William A Fennelly, chairman, New York; Morris L. Biderman, Providence, R. I., and Allen R. Cutler.

Hospital Dental Service • Joseph B. Zielinski, chairman, Chicago; L. W. Burket, Philadelphia, and C. C. Cottrill, Glen Rogers, W. Va.

Insurance • Robert O. Schraft, chairman, San Francisco; C. Raymond Wells, Brooklyn, and P. B. Hair, Spartanburg, S. C.

Legislation • James E. Berney, chairman, Davenport, Iowa; A. V. Diedrich, Detroit, and Stephen M. Lyons, Summit, N. J.

Miscellaneous Business • Sau Yee Chang, chairman, Kauai, Hawaii; Glenn C. Anderson, Avoca, Iowa, and Isidore Teich, New York.

Prosthetic Dental Service • Walter B. Martin, chairman, Seattle; G. Herbert Fitz, Pontiac, Ill., and H. N. Wagner, Henryetta, Okla.

Public Health • R. A. Hart, chairman, Saginaw, Mich.; Floyd E. Williams, Manchester, N. H., and William H. Sowle, Rockford, Ill.

Reorganization of Trustee Districts • O. H. Moen, chairman, Watertown, Wis.; J. T. O'Leary, Girard, Pa., and V. A. Corbett, Minot, N. D.

Report of President • W. N. Hodgkin, chairman, Warrenton, Va.; Alfred E. Smith, New Orleans, and M. G. Walls, St. Paul.

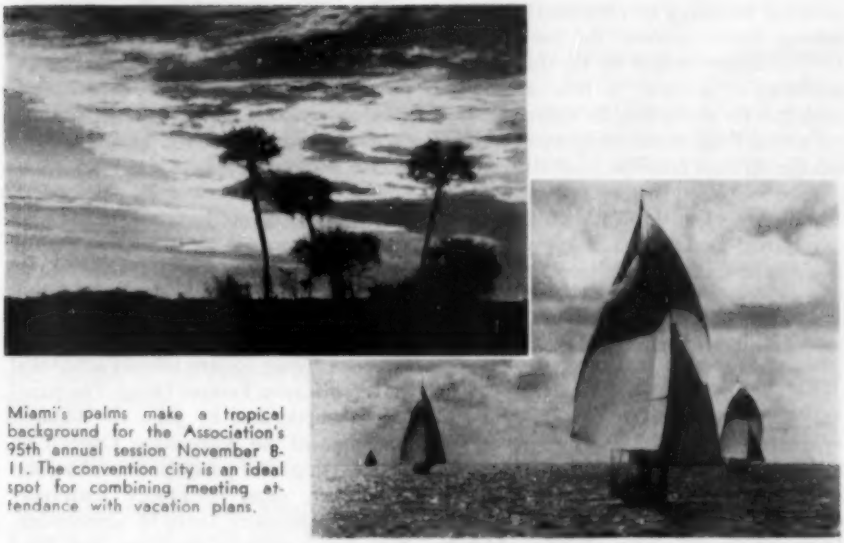
SCIENTIFIC SESSION

Panel discussions are scheduled on elastic impression materials, effects of sugars and other carbohydrates on the teeth, newer devices for cutting tooth structure, hazards of roentgenography in dentistry and endodontic procedures for the general practitioner. The section on oral surgery and anesthesia is presenting a symposium on the dentist's responsibilities in atomic bomb disaster.

Moderator for the panel on cutting devices will be Rex Ingraham, head of the department of operative dentistry at the University of Southern California College of Dentistry. Under discussion will be the ultrasonic drill, airbrasive cutting devices and the high-speed rotary drill.

Heading the panel on hazards in dental roentgenography is Lee Roy Main, dean of St. Louis University School of Dentistry. The film *Hazards of Dental Ra-*

A view of Havana, Cuba. A special postconvention tour of Havana has been planned for Association members by the Cuban Dental Society. Guests may travel by boat or plane. Flying time to Havana is 55 minutes.



Miami's palms make a tropical background for the Association's 95th annual session November 8-11. The convention city is an ideal spot for combining meeting attendance with vacation plans.

diography, winner of an international film prize, will be shown.

Moderating the panel on elastic impression materials will be Maynard K. Hine, dean of Indiana University School of Dentistry. The discussion on the effects of sugar and other carbohydrates on the teeth will be moderated by Harold J. Noyes, dean of The Dental School, University of Oregon; that on endodontic procedures by Floyd D. Ostrander, professor of dentistry at the University of Michigan School of Dentistry, and that on the dentist's role in atomic bomb disaster by James R. Cameron, professor of oral surgery at Temple University School of Dentistry.

An innovation of this year's program will be the 36 projected clinics, in which clinicians will use slides and other visual aids in their presentations. The projection feature makes it possible for large groups of dentists to attend the clinic at the same time and to see in detail various technical and clinical demonstrations.

In addition to the projected clinics, the program includes table clinics, scientific exhibits, motion pictures and technical exhibits.

Motion Picture Program • Films in the areas of prosthodontics, oral surgery, anesthesia, endodontics, civil defense and dental health are listed on the film program. Of these, 38 have never been shown at an annual session. The films have been coordinated with the panel discussions so that persons attending a particular panel may see films on the panel subject during the same day. Twenty-one films will be repeated to accommodate those persons who are unable to see them during the first part of the week.

Scientific Exhibits • Among the 53 exhibits at this year's annual session is a prize winner at the 94th annual session, which presents artificial mouths simulating *in vivo* conditions. The "mouth" permits a method of studying the etiology of dental caries.

Exhibits which will have their premier

showing include a new method of desensitizing dentin without the use of anesthetics, demonstrated by the Japan Stomatological Society; a new diagnostic principle for predicting the extent of dental caries from roentgenograms, and an exhibit on resin cements, presenting information obtained through a dental research project at the National Bureau of Standards. In addition, there will be a number of exhibits on different aspects of the treatment of cleft palates.

DENTAL HEALTH CONFERENCE

What dental services should state health departments provide? How should state dental directors assist in community programs? Why does dentistry need a top level administrative position in the state program? These questions are among those which the fifth National Dental Health Conference will attempt to answer as it studies the content and financing of state dental health programs November 6 at the McAllister Hotel. The Conference is sponsored by the Council on Dental Health. David W. Brock, Council chairman, will preside.

Highlighting the morning session will be a panel on the financing of the dental health program now in operation in Tennessee. The program will be discussed by Carl L. Sebelius, director of the division of dental health of the Tennessee Department of Health; J. J. Vaughn, chairman of the legislative committee of the Tennessee Dental Association, and Doyle J. Smith, also of the Tennessee Association. Featured speaker for the morning will be Donald J. Galagan, assistant chief of the Division of Dental Public Health, U. S. Public Health Service.

Afternoon speakers are Francis J. Garvey, secretary of the Council on Legislation, and Lloyd H. Dodd, Illinois Department of Public Health. Also scheduled are a series of ten minute reports on specific cooperative projects of state health departments and state dental societies.

Reservations for the Conference luncheon, at which Oren A. Oliver, chairman of the Public Health Council, Tennessee Department of Public Health, will speak, should be made with the Council on Dental Health at the Central Office before November 1.

STATE SOCIETY OFFICERS

What constituent societies should do about Association student membership will be the topic of a panel planned for the morning of November 7 at the conference of state society officers scheduled for the Biscayne Terrace Hotel. The panel will be moderated by John R. Wallace, chairman of the Association Council on Membership, and participated in by John E. Buhler, dean of Emory University School of Dentistry, Louis M. Cruttenden, Association assistant secretary, and John G. Carr, secretary of the New Jersey State Dental Society.

A second panel, the dentist's responsibility in atomic bomb disaster, is set for the afternoon. Moderating the discussion will be John R. Abel, chairman of the committee on civil defense of the Association. Panelists are Gerald M. McDonnel, M. D., of the radiology service at Walter Reed Hospital; Russell W. Sumnicht of Walter Reed Army Medical Center, and Frank B. Berry, M.D., Assistant Secretary of Defense for Health and Medical Affairs.

During the afternoon, William L. Barnum, chairman of the Council on Journalism, will discuss constituent society publications.

JOURNALISM CONFERENCE

Preparation of manuscripts for publication, including nomenclature and common errors in writing, is the subject to be discussed by Lon W. Morrey, editor of *The Journal of the American Dental Association*, at the joint meeting of the American Association of Dental Editors

and the Council on Journalism November 6 at the McAllister Hotel.

Speaking on advertising and dental journalism is Walter Hyde, editor of *North-West Dentistry*. The use of abstracts in dental journals will be discussed by Austin H. Kutscher, associate editor of the *New York State Dental Journal*. Kent F. Kohler, editor of the *Dental Alumni Bulletin* of the University of California, will talk on "The New Editor Approaches His Job."

Walter McBride, president of the American Association of Dental Editors and member of the Council on Journalism, will preside.

HOTEL ACCOMMODATIONS

As of September 1, more than 6,300 persons already had made reservations and more than 12,000 were expected to attend the annual session, Louis M. Cruttenden, Association assistant secretary, has announced. To date, 19 hotels are reported filled, but there are still enough hotel accommodations for persons wishing to attend the meeting. Rates as low as $3 a day per person are available through the hotels cooperating with the Association Housing Bureau.

Reservations for housing should be made on the official application blank on page A-19 of *The Journal* and mailed to the Association Housing Bureau, 320 N.E. Fifth Street, Miami, Fla.

WHO MAY ATTEND

Those eligible to attend the meeting are Association members and their families, dental assistants, dental dealers and manufacturers, dentists holding membership in the National Dental Association, dentists from abroad, those exhibiting at the meeting, members of county or state medical societies, dental hygienists, dental laboratory technicians and dental students.

OTHER EVENTS

There will be a luncheon for international guests at the Biscayne Terrace Hotel November 9, reports Oren A. Oliver, chairman of the Council on International Relations. Some 75 guests are expected to attend, many of them from the Pan-American countries.

Social Affairs • Among the social events are the President's dinner, November 10; a fashion show, boat trip and tour of Vizcaya, the castlelike estate of the late James Deering, November 9; a symphony concert by the University of Miami Symphony Orchestra, November 9, and fraternity banquets scheduled for November 10.

Cuban Tour • Postconvention tours are planned by the various travel agencies, and a special invitation has been extended by the Cuban Dental Society to Association members to attend its fourth national convention after the annual session. The Cuban dentists have planned a tour of Havana November 12-16. Reservations for housing in Cuba may be made by writing to Antonio Montero, Housing Bureau, Colegio Estomatológico Nacional, Edificio Retiro Odontológico, Vedado, Havana, Cuba.

WHAT TO WEAR

The Committee on Local Arrangements suggests the following items of apparel for Miami visitors: for the ladies—a light-weight suit for cool weather, dark cotton dresses for sightseeing and shopping, dressy afternoon dresses for dinner and evening events, a light jacket or stole for November evenings, a formal for the President's banquet is optional. For the men—casual clothes for meeting attendance, sport shirts and sport jackets, dark business suits for evening events, for the president's banquet, dark trousers and white dinner jacket are suggested.

A.D.A. MEMBER HEADS NBS MINERAL PRODUCTS DIVISION

Irl C. Schoonover, Ph.D., an honorary member of the American Dental Association, was appointed chief of the Mineral Products Division of the National Bureau of Standards August 1, according to Allen V. Astin, Ph.D., director of the Bureau. Dr. Schoonover, formerly assistant chief of the NBS Organic and Fibrous Materials Division and chief of the Polymer Structure Section, succeeds Herbert Insley, Ph.D., who retired last January.

The Mineral Products Division, which Dr. Schoonover heads, works toward the more efficient use of nonmetallic inorganic mineral products for defense and civilian use.

Dr. Schoonover has done extensive work on dental materials. He was chief of the NBS Dental Materials Section from 1945 to 1952. In this position he was largely responsible for the organization of a basic research program on solid-state studies related to solid and plastic materials. In addition to holding honorary membership in the American Dental Association, Dr. Schoonover is a member of the Washington Section of the International Association for Dental Research. He served as president of the Section in 1949.

1955 DIRECTORY TO LIST MORE THAN 90,000 DENTISTS

More than 90,000 U.S. dentists will be listed in the 1955 edition of the American Dental Directory, which will be available in January, 1955. The new edition, which lists names and addresses of all dentists in the United States and its territories, will contain more than 25,000 address changes compiled since the 1954 edition was published. Price of the publication is $6 if ordered before October 15 and $7.50 after this date.

The directory will contain up-to-date information on key dental personnel in each state, the requirements of state dental examining boards, the list of dental schools and the names and addresses of national dental organizations of the world. Also included will be a geographical listing of specialists, specialty boards and members of the Association in foreign countries.

Advance orders for the Directory may be sent to the Order Department of the Association at the Central Office.

KATHERINE JACOB, WIFE OF ILLINOIS TRUSTEE, DIES

Mrs. Katherine L. Jacob, wife of L. H. Jacob, Association trustee for the Eighth District, died at her home in Peoria, Ill., September 11 after a long illness. Mrs. Jacob was 59 years old. She is survived by her husband, three daughters and seven grandchildren. Funeral services were held September 14 in Peoria.

REPRINTS OF ARTICLES ON ANTIFLUORIDATIONISTS READY

Reprints of a series of articles from the *Toledo Blade* exposing the national leaders of the fight against fluoridation are available from the Association's Bureau of Public Information. The articles, written by Ray Bruner, the *Blade's* science editor, detail the activities and careers of such people as C. T. Betts of Toledo, Ohio, and Royal Lee of Milwaukee.

According to the *Blade,* Dr. Betts was licensed to practice dentistry in 1902. He did not graduate from a dental school, the articles point out, but was licensed because he had been in practice for some years prior to the passage of the licensure law. An American Medical Association investigation found that Dr. Betts "has for many years been engaged in the business of selling pamphlets on unscientific medical subjects." Dr. Lee, according to A.M.A. records, the *Blade* continues,

"does business as the Vitamin Products Co. and the Lee Foundation for Nutritional Research." In 1940 he was found guilty of misbranding Catalyn, one of his products. Dr. Lee had claimed that Catalyn would cure goiter, Bright's disease, falling hair, "restless sleep," St. Vitus' dance and other ailments.

DENTAL FILMS DESCRIBED IN NEW ASSOCIATION BOOKLET

The Association's Film Library has recently published a booklet entitled *Audio-Visual Materials in Dentistry*. The booklet, first of its kind published by the Association, lists films, filmstrips and slides which are available from the Film Library. The library has films suitable for use by the profession as well as films suitable for general showing, announced Helaine Levin, film librarian.

The brochure also contains film reviews, a list of films cleared for television and the names of major film producers from whom films may be ordered. Copies of the brochure may be obtained from the Film Library, Bureau of Library and Indexing Service, at the Central Office.

VERNON HUNT, PROMINENT CALIFORNIA DENTIST, DROWNS

Vernon L. Hunt, 60, prominent California orthodontist and consultant to the National Board of Dental Examiners, drowned in a fishing accident in the Klamath River September 5. Two other men, Frank Smith, Eureka, Calif., dentist, and Ritchie Woods, retired druggist, were drowned with him.

Dr. Hunt was a vice-president of the California State Board of Dental Examiners. He had been appointed to the Board in 1946, served twice as its vice-president, and once as president. He has served as California delegate to the American Dental Association's annual session, and was active also in county and state dental society affairs. Dr. Hunt lectured widely and conducted clinics before many groups. He was a Fellow of the American College of Dentists and the International College of Dentists and a member of Omicron Kappa Upsilon.

JOURNAL OF ORAL SURGERY OFFERS STUDENT RATE

A special offer is being made to dental students to subscribe to the *Journal of Oral Surgery* at half the regular subscription price, according to Fred A. Henny, editor. A letter announcing the student rate of four dollars has been sent to all professors of oral surgery in the United States and Canada, as well as to heads of dental services in hospitals which have oral surgery services.

SUGGEST GIFT SUBSCRIPTION TO ORAL SURGERY JOURNAL

A Christmas gift order blank will be enclosed with the October issue of the *Journal of Oral Surgery*, Fred A. Henny, editor, has announced. By using the order blank, readers will have a convenient way of sending a subscription to the magazine as a holiday gift. Under the gift subscription plan, a card will be sent by the Association to the recipient December 1 telling him from whom the journal came.

AUGUST MEMBERSHIP TOPS LAST YEAR'S TOTAL

Membership in the American Dental Association stood at 81,584 as of August 31, a gain of 482 members over the previous month. The various types of membership—fully privileged, affiliate and student members—all increased. A year ago, Association membership stood at 79,156.

Legislation

OASI EXCLUDES DENTISTS, VA DENTAL BILL DIES

The presidential signature was attached last month to Old Age and Survivors Insurance amendments which, while providing coverage for nearly all employed and self-employed persons, excludes physicians and dentists. The exclusion of dentists had been urged by Association spokesmen in testimony before committees of both Houses of Congress. OASI as it now stands extends coverage to about 10 million additional persons, liberalizes benefits and increases the social security tax. Persons between the ages of 65 and 72 may earn up to $1,200 a year without losing benefits. After 72 years of age, they receive full payment regardless of earnings.

The 83rd Congress, in its second session, passed a number of other bills of interest to dentistry.

VA Outpatient Dental Care • The Veterans Administration budget as passed by Congress contains $11,200,000 for fee-basis, outpatient dental care. A bill limiting dental care for veterans died in the Senate, but regulations of the VA and riders attached to appropriations measures limit care to a single series for a proved service-connected disability. Treatment must be requested within one year of service discharge.

Hospital Construction • The Hill-Burton Hospital Construction Act was expanded to permit the government to spend $182,000,000 to help finance construction of nonprofit diagnostic and treatment centers. Association spokesmen testified for and got inclusion of dental facilities in the building program.

U. S. Public Health Service • The USPHS budget contains $1,990,000 for dental activities, an increase of $250,000 over the fiscal 1954 budget. At the request of the Association, $260,000 more than the President had asked was added to the budget.

Indian Health Services • In another action, Congress transferred the Indian hospital and medical service from the Indian Bureau of the Department of Interior to the U. S. Public Health Service.

Unemployment Compensation • Also passed was an extension of unemployment insurance coverage. The new law, which becomes effective January 1, 1956, has been broadened to reach employers with four or more employees. Some 1,200 dentists are affected.

Deduction for Medical Expenses • In rewriting federal tax laws, Congress allowed tax deduction for medical expense above 3 per cent or more of income. Previously the baseline was 5 per cent. In addition, the maximum permissible deduction was doubled.

Doctor-Draft Law • Physicians and dentists who are refused commissions may now be used in their professional capacity as enlisted men under the doctor-draft amendment passed by Congress.

Dental Societies

PUBLIC INTEREST SHOWN IN "ASK THE DENTIST" PROGRAM

A new program entitled "Ask the Dentist", sponsored by the Albuquerque, N. Mex., District Dental Society, is being viewed with interest by TV audiences as demonstrated by the phone calls received during the show. Each week the Society's television program committee selects a panel of dentists to discuss a particular phase of dentistry. The panel

introduces the subject for the evening and then answers questions phoned in by the audience. As many as 68 calls have been received during one program. An average number of 30 questions are answered on each show.

The committee in charge of the program consists of Kenneth P. Eiffert, John W. Farley, Jr., William E. Dennard, F. A. Lemoine, Elbert W. King, Alfred L. Lopez and W. H. Danley, Jr. Time has been donated by station KOAT-TV.

CONNECTICUT DENTISTS ACT ON JOINT CONFERENCE COMMITTEE

An improvement in understanding between physicians, dentists and pharmacists has come about in Connecticut through the work of the Joint Conference Committee of Connecticut, according to Gilbert LeVine Mellion, chairman of the organization's dental delegates. The Joint Conference Committee is composed of five representatives each from the Connecticut Dental Association, the Medical Society and the Pharmaceutical Association who meet four times a year to discuss problems of mutual interest to the professions. Problems are referred to the Conference Committee by local associations as well as by departments of the state government which deal with public health matters.

Since joining the Conference Committee, the dental delegation has introduced *Accepted Dental Remedies* to the pharmacists, many of whom were not familiar with it. Dental delegates are Gilbert LeVine Mellion, Rocky Hill; Jacob R. Bourke, East Hartford; Alfred J. Gengras, Jr., Hartford; Frederic S. Harold, New Haven, and James P. Lawlor, Waterbury.

On July 18 the past presidents of the Illinois State Dental Society celebrated the 90th anniversary of the Society by visiting Winchester and Jacksonville, Ill., the early residences of "the father of modern dentistry," G. V. Black. Dr. Black was president of the Society in 1871 and wrote over 500 papers on various dental subjects, many of which were first presented before the Illinois group. Shown at Dr. Black's grave (l. to r.) are J. Roy Bleyney, J. E. Mahoney, W. A. McKee, W. D. Vedder, John W. Green, B. H. Sherrard, M. E. Zinser, A. E. Converse, R. G. Kesel, W. J. Gonwa and G. E. Cartwright.

DENTAL CARE PLAN FINANCING TOPS SIX MILLION MARK

The California State Dental Association postpayment plan has financed over six million dollars worth of dental care in its three years of operation and has handled 27,147 accounts, according to Lawrence R. Ludwigsen, Association secretary. The amount of the average note has been about $226, reports Dr. Ludwigsen, and losses due to unpaid accounts have averaged 1.7 per cent, which is considered very low.

The plan, which assists patients in paying for dental care, is run by the Association in conjunction with the Bank of America. Under the plan, a patient may receive immediate dental care and the dentist immediate payment.

The patient applies for financial aid in his dentist's office. If his application is accepted, he pays the Bank in small installments after receiving care. The dentist is paid the full amount of the bill immediately, less a 5 per cent discount, which is put aside as a reserve against unpaid accounts. A total of 1,736 dentists are participating in the plan.

COLOR TV A FEATURE OF GREATER NEW YORK MEETING

Color television programs will highlight the program of the Greater New York Dental Meeting scheduled for December 6-10 at the Hotel Statler in New York. Ten practitioners will work with patients before the television camera, and the surgical and clinical demonstrations will be projected on two giant screens. For the first time at a Greater New York meeting, materials, methods and equipment used in dental research will be demonstrated by researchers. The application of ultrasonics to the cutting of teeth, electron microscopy of dental tissue and the use of air as a power source for dental handpieces will be shown.

Also on the program is a panel of five specialists who will present the problems of occlusion in relation to periodontics, orthodontics, complete dentures and crown and bridge prosthesis. Two well-known prosthodontists will discuss the technics used in obtaining vertical dimension, centric occlusion and the procedures used to obtain correct positioning of the teeth. Projected clinics, table clinics and motion pictures are planned also.

Public Health

CEREMONIES MARK START OF PHILADELPHIA FLUORIDATION

Ceremonies marking the start of fluoridation in the nation's third largest city were held September 22, when members of the dental profession and city officials took part in valve-turning ceremonies at Philadelphia's Queen Lane pumping station. Philadelphia, with a population of more than 2,000,000, is the largest U. S. city to begin a fluoridation program.

Mayor Joseph Clark and Water Commissioner Samuel S. Baxter headed the group which participated in the formal ceremonies. Officially representing the dental profession were Charles H. Patton, Association trustee for the Third District; Thomas Fox, president-elect of the Pennsylvania State Dental Association; E. R. Cerino, president of the Philadelphia County Dental Society, and LeRoy Ennis, former Association president and chairman of the City Council's first committee to study fluoridation.

Fluoridation was originally approved by the City Council in November 1951, but start of the program was delayed pending appropriation of necessary funds.

Including Philadelphia, 1,010 communities with a population of 20,127,484 are now served by the health measure.

Dental Education

CALIFORNIA DENTAL SCHOOL TO HAVE NEW HOME

The University of California College of Dentistry in San Francisco will occupy the 5th, 6th and 7th floors of the Medical Sciences Building beginning with the Fall semester, the school has announced. The new quarters are provided as part of a 25 million dollar building program on the Medical Center campus.

Present clinics will be retained and augmented with additional clinics, teaching laboratories and research quarters in the new building. The new facilities will permit an ultimate increase in enrollment of 25 per cent. Further expansion of the Medical Sciences Building is planned, and a portion of the second increment also is earmarked for the College of Dentistry.

DENTAL SCHOOLS OFFER GRADUATE COURSES

California • A general review course in dentistry will be given for eight weeks beginning November 29 at the University of California Extension in Los Angeles. Lectures will be given on a large number of subjects including anatomy, chemistry, dental materials, oral diagnosis and roentgenology. More than half of the course time will be devoted to laboratory technics and clinical procedures.

Indiana • A course in fixed bridge construction will be offered October 18-22 by the Indiana University School of Dentistry in Indianapolis. The five day course will be presented by John F. Johnston, J. William Adams, Roland Dykema, Ralph McDonald, Ralph Phillips, Ronald Ping and H. M. Swenson, of the staff.

Marquette • The School of Dentistry of Marquette University in Milwaukee is offering 16 short refresher courses during the 1954-55 school year in the dental implications of speech problems, oral surgery, orthodontics, hospital procedure, periodontics and other subjects. Residencies and internships for qualified candidates also are available.

Washington (Seattle) • C. N. Skinner, chief of the Los Angeles County Hospital attending staff, will present a course in partial dentures at the University of Washington School of Dentistry in Seattle November 1-4. The objective of the course is to teach the practicing dentist modern technics of partial denture construction and will be presented by means of lectures, slides and model demonstrations.

Armed Forces

CLEMENS RAULT NAMED TO VA ADVISORY POST

Clemens V. Rault, dean of Georgetown University School of Dentistry, has been named a member of the Special Medical Advisory Group to the Veterans Administration. He replaces John S. Voyles of St. Louis. Dr. Rault entered the U. S. Navy in 1918 and advanced through the ranks to the post of Rear Admiral. He retired from the Navy in 1950. Among the organizations to which he belongs are the American College of Dentists, the International College of Dentists and the International Association for Dental Research.

Other newly appointed members of the VA Advisory Group are David O. Harrington, M.D., ophthalmology, Donald E. Hale, M.D., anesthesiology, I. S. Ravdin, M.D., surgery, and Elmira B. Wickenden, R.N., nursing. The group met in Washington September 13.

Gen. Marvin E. Kennebeck, DC, USAF (left), presents the First Oak Leaf Cluster to the Commendation Ribbon to Col. Arthur E. Brown, USAF retired, in a ceremony held during May in the Office of the Surgeon General, U.S. Air Force. Colonel Brown was recently retired from Sampson Air Force Base, New York, where he served as director of dental services from October 1951 to October 1953.

Brig. Gen. James M. Epperly (center), director of dental activities at Brooke Army Medical Center, San Antonio, Texas, greets Maj. Enver Plumer (right), first officer of the Turkish Army Dental Corps to come to Brooke for advanced training. At left is Col. James S. Pegg, director of the department of dental services at the school.

The Health Resources Advisory Committee of the Office of Defense Mobilization met with President Eisenhower August 6 to discuss health problems. Shown (l. to r.) are: Edwin L. Crosby, M.D.; Alan Gregg, M.D.; Leo J. Schoeny, dentist member of the Committee; Francis J. Braceland, M.D.; Harold S. Diehl, M.D.; Ruth Sleeper, R.N.; the President; Howard A. Rusk, M.D.; Eugene J. Taylor; Paul C. Barton, M.D.; William P. Shepard, M.D., and J. E. Brown, Jr. (Courtesy, AP Photo Service).

Chiefs of the federal dental services met August 3 in Washington, D. C. Shown (l. to r.) are: John E. Fauber, Veterans Administration; Maj. Gen. Oscar P. Snyder, U. S. Army; Rear Admiral Daniel W. Ryan, U. S. Navy; Brig. Gen. Marvin E. Kennebeck, U. S. Air Force, and John W. Knutson, U. S. Public Health Service.

Lt. Gen. Withers A. Burress (right), First Army commander, presented the Legion of Merit to Col. William T. Williams, First Army dental surgeon, at a ceremony on Governors Island, N. Y., August 27. Colonel Williams was cited for outstanding service with the Army in Japan from November 1952 to June 1954.

Capt. Clay E. Boland, (DC) USNR, (left) welcomes Capt. Collister M. Wheeler, (DC) USNR, who succeeded him August 13 as head of the Dental Reserve Branch of the Dental Division, Bureau of Medicine and Surgery, Navy Department, Washington, D. C. Captain Wheeler is a past president of the Portland, Ore., District Dental Society. Captain Boland leaves to become assistant district dental officer of the Third Naval District.

ARMED FORCES SYMPOSIUM PRESENTS OCTOBER PROGRAM

The Dental Division of the Armed Forces will participate in the fifth annual military medicodental symposium to be presented October 18-23 at the U. S. Naval Hospital in Philadelphia. Two special sessions have been assigned to dentistry.

Among the essayists are Capt. Clay A. Boland, assistant district dental officer, Third Naval District, New York; Levon M. Saghirian, Graduate School of Medicine, University of Pennsylvania; Lt. Col. William B. Simms, chief of the dental service, Valley Forge Army Hospital, Phoenixville, Pa.; Joseph M. Bransky, Phar. G., district supervisor of the Bureau of Narcotics, U. S. Treasury; Dwight S. Coons, University of Pennsylvania; and Howard G. Kimball, Walter A. Cohen, Carl T. Leander and Lt. Col. Samuel Seltzer, (DC) USAR, all of the School of Dentistry, University of Pennsylvania.

One retirement point credit will be given for each day of attendance.

Research

EUROPEAN RESEARCHERS DISCUSS CARIES CONTROL

The first session of the European Organization for Coordination of Research on Fluorine and Dental Caries Prophylaxis was held in Salzburg, Austria, May 29 and 30. Some 54 members from 17 countries of Europe attended the meeting. Reports on research on caries were made by Professor D. Knappwost, Mrs. Hafer, Professor May and Miss Schutzmannsky of Germany; Professor Palazzi and Professor Fiorentini of Italy; Dr. Krusic of Yugoslavia, and Dr. Hs. R. Held and A. J. Held of Switzerland.

The next meeting will be held May 18 and 19, 1955, in Geneva, Switzerland.

URUGUAYAN IS GUEST WORKER IN DENTAL RESEARCH AT NBS

Hector Sacchi, professor of operative dentistry at the University of Montevideo in Uruguay, is to be a guest worker in the Dental Research Section at the National Bureau of Standards for the next several months. Dr. Sacchi, who will be

Hector Sacchi

doing research on fused porcelain, has been provided with a fellowship by his university and has been appointed a scientific attaché of the Uruguayan embassy as well. He will work under the supervision of W. T. Sweeney, chief of the NBS Dental Research Section, and George C. Paffenbarger, senior research associate of the American Dental Association at the Bureau.

Among other visitors to the Dental Research Section in recent months were Alva Willson, Peru; J. Van Aken, Holland; Yvia A. Cantin, France; Christor Psilakis, Greece; Bernhard Kaplan, Israel, and Kensahu Suzuki, Japan.

NAVY ANNOUNCES NINE DENTAL RESEARCH GRANTS

The Office of Naval Research has announced nine research grants which have been awarded to universities and nonprofit research institutions for periods of one to three years. The contracts are for research on development of an artificial mouth for *in vitro* studies of dental

caries, University of Alabama; salivary enzymes related to oral disease, Tufts College Dental School; specific antihyaluronidases in serum, Tufts College Medical School, and amino acid deficiencies in bone and tooth metabolism, University of Southern California.

Also to be studied are the mechanism of calcification and the caries problem, The Jewish Hospital of Brooklyn; clinical and experimental investigation of pulpotomy in permanent teeth, University of Illinois; effects of tryptophane deficiency on the teeth and periodontium, University of Southern California; research in periodontal disease, University of Minnesota, and proteins and mucopolysaccharides of teeth, Georgetown University.

ULTRASONIC PHOTOGRAPHING DEVICE DEVELOPED BY VA

The development of an ultrasonic photographing device which may contribute greatly to the more accurate diagnosis of disease was announced September 16 by the Veterans Administration. The machine, invented by Douglass H. Howry, M.D., former VA resident in radiology, produces well-defined pictures of cancers, goiters and cysts in the body's internal organs, a thing which the x-ray machine and fluoroscope cannot do.

The device combines the principles of sonar, radar and television. Research on the machine is continuing.

CANADIAN RESEARCH COUNCIL OFFERS FELLOWSHIP

The Associate Committee on Dental Research of the National Research Council is offering a senior dental research fellowship to a qualified Canadian. A candidate must have had several years of postgraduate training and must have demonstrated his capacity for independent research. The amount of the fellowship will run from $3,000 to $5,000 a year depending on the candidate's training. The fellowship may be renewed annually for a period up to five years.

Further information may be obtained from the Awards Officer, National Research Council, Ottawa, Canada. The two closing dates for applications are October 15 and February 1.

International

DENTAL SPECIALISTS TO ATTEND PERU CONGRESS

Specialists in the various branches of dentistry from the United States, Europe and Latin America will take part in the Fourth National Dental Congress in Lima, Peru, November 14-20. The Congress celebrates the 25th anniversary of the Academia de Estomatologia del Peru. Among those attending from the United States are Samuel Brandon, Portland, Ore.; Spencer R. Atkinson, Pasadena, Calif.; H. Justin Ross, New York; Berto Olson, Hollywood, Calif., and John E. Fields, a vice-president of the University of Southern California.

DENTAL REPRESENTATIVE FOR SHAPE URGED BY F.D.I.

A permanent military dental representative for the Supreme Headquarters Allied Powers Europe (SHAPE) was urged by the Fédération Dentaire Internationale at its meeting in Holland June 8-13. The text of the resolution passed by the F.D.I. General Assembly for submission to the Supreme Commander Allied Powers in Europe reads, "The Commission requests that a Permanent Military Dental Representative be assigned to Supreme Headquarters Allied Powers Europe on a permanent basis and to such other subheadquarters of SHAPE as may

Among the delegates to the June meeting of the Fédération Dentaire Internationale held in Holland were: Harold Hillenbrand, American Dental Association secretary (seated second from right); Oren A. Oliver, chairman of the Association's Council on International Relations (seated sixth from right), and Herbert Loeb, of Boston, an alternate delegate (standing, tenth from right). Dr. Oliver was reelected F.D.I. president. Dr. Hillenbrand continues as an honorary vice-president.

in the future be established where a staff for health services is set up."

In other resolutions, the F.D.I. called for increased support for research into dental problems and diseases and recommended that dentists in all countries in the military services be accorded officer status. The F.D.I. Council was asked to examine the position of ancillary dental workers in dental health services with regard to their effective utilization and supervision by qualified dental personnel. The Council also was asked to alert public opinion to the danger of allowing dental technicians to do work other than that appropriate to the dental laboratory.

ARGENTINE GROUP TAKES PART IN LATIN-AMERICAN MEETING

The Federación Odontológica Argentina, the group which sponsors practically all the dental meetings in Argentina, will take part in an October meeting of the Federación Odontológica Latino-Americana to be held in Brazil.

Three dental groups, the Asociación Brasilera de Odontología, the Asociación Paulista de Cirujanos Dentistas and the Asociación Odontológica Uruguaya, are sponsoring a course on endodontics by Louis I. Grossman of the University of Pennsylvania dental school.

ARGENTINE ASSOCIATION PLANS NOVEMBER PROGRAM

Clinical demonstrations on patients, table clinics, discussion groups, motion pictures and exhibits are planned for the November 10-12 meeting of the Asociación Odontológica Argentina to be held in the city of Mendoza. Preceding the scientific program, a visit to places of interest in the province of Mendoza has been planned. Further information may be obtained from Enrique E. Müller, secretary of the Asociación Odontológica Argentina, Junin 959, Buenos Aires, Argentina.

COLOMBIAN DENTISTS ELECT NEW OFFICERS

At a meeting held July 29 the following officers were elected by the Sociedad Odontologica Antioqueña, an affiliate of the Colombian Dental Federation: Julian

Cadavid G., president; Jairo Isaza C., vice-president; Arturo Gonzalez Ch., secretary; Inés Franco V., treasurer; Antonio Mejia P. and Javier Echavarría R., members of the board of trustees.

NEW SCHOOL PLANNED BY UNIVERSITY OF CHILE

The Board of the University of Chile will build a new dental school in Valparaiso, reports Raúl Muñoz Inza, of Santiago. The first classes are expected to begin in 1955. Dr. Inza reports also that Carlos Tapia Depassier has been named dean of the dental faculty of the University. Long active in dental education, Dr. Depassier previously was professor of pedodontics. The Asociación Odontológica de Chile elected as officers for 1954-55 Alberto Ducheylard, president, and Hernan Barahona J., secretary.

CHILEAN DENTAL SOCIETY ELECTS OFFICERS

The following have been elected officers of the Dental Society of Chile for the 1954-55 term: Alberto Ducheylard de los R., president; Rodolfo Villaseca H., vice-president; Hernán Barahona J., secretary; Gilberto Labarca R., treasurer; Antonio Monserrat R., Rubén Quintana O., Rubén Bascuñan S., Fresia Rubio H., Joaquín Prieto S., Fernando Viveros J. and Santiago Serendero M., directors.

General

IMPLANT DENTURE ACADEMY STARTS NEW JOURNAL

The American Academy of Implant Dentures has authorized the publication of a new journal called *The Journal of Implant Dentistry,* the first issue of which will appear in November. The dental schools and members of the Academy will be mailed the first edition. Other dentists who wish to subscribe may do so by writing to Arthur C. Jermyn, editor, Brighton Medical Center, 920 Winton Road South, Rochester, N. Y. *The Journal of Implant Dentistry* will be published twice yearly.

LABORATORY OWNERS DISCUSS CODE OF FAIR PRACTICES

A proposed code of fair practices for the dental laboratory industry was discussed between representatives of the Federal Trade Commission and the National Association of Dental Laboratories in New Orleans September 16. The meeting was presided over by Commissioner Mason and considered rules to govern such questions as misrepresentations, guarantees, use of the word "free" and selling below cost. The Federal Trade Commission will issue a final draft of the proposed Code of Fair Practice within the next two months and will hold public hearings on the rules at a later date.

AMERICAN ACADEMY OF DENTAL MEDICINE MEETS DECEMBER 5

Three essayists will be featured at the ninth mid-annual meeting of the American Academy of Dental Medicine December 5 in New York City. Taking part in a symposium on bone are Harry Sicher of Loyola University School of Dentistry (Chicago), who will discuss bone formation and resorption; J. P. Weinmann of the College of Dentistry, University of

Illinois, who will speak on variations in the structure of bone tissue and their significance in roentgenology, and Lester Cahn of the School of Dental and Oral Surgery, Columbia University, who will discuss the correlation between clinical roentgenological and histological studies in bone lesions.

MINNESOTA PEDODONTICS SOCIETY TO MEET

Behavior patterns in young children which affect dental practice, treatment of permanent anterior teeth with fistulas, and clinical problems in pedodontics are among the subjects to be discussed at the October 15 meeting of the Minnesota unit of the American Society of Dentistry for Children to be held at the University of Minnesota in Minneapolis. Participating in the program are John E. Anderson, Ph.D., director of the Institute of Child Welfare, University of Minnesota; Reynold Jensen, M.D., associate professor of pediatrics, department of psychiatry, University of Minnesota Hospital; James Jensen, School of Dentistry, University of Minnesota; George W. Teuscher, dean of The Dental School, Northwestern University, and Walter T. McFall of Chapel Hill, N. C.

DANIEL A. LISTIAK, MINNESOTA PROFESSOR, DIES AT 45

Daniel A. Listiak, professor and chairman of the division of prosthetic dentistry at the University of Minnesota School of Dentistry, died August 16 at the age of 45. Dr. Listiak lectured throughout the United States and Canada and made frequent contributions also to the dental literature. A graduate of the University of Minnesota School of Dentistry, he joined its faculty in 1932. In 1941 he joined the staff of Baylor University and returned to the Minnesota school in 1943, where he taught until his death.

Dr. Listiak was a consultant in prosthesis at the Minneapolis and St. Cloud Veterans' Hospitals. He was a Fellow of the American College of Dentists and a member of Omicron Kappa Upsilon.

Also • The Pan-American Odontological Association will hold its eighth annual dinner meeting December 8 at the Waldorf Astoria Hotel in New York. . . . A letter from Curtis F. Culp, M.D., director of the medical field services of United Cerebral Palsy, to the American Dental Association Council on Dental Health, thanked the Association for the interest shown by the profession in cerebral palsy. UCPA has urged its affiliates to have a dentist serve on UCPA medical-professional advisory boards. . . . Sigma Epsilon Delta will hold its annual dinner in conjunction with the Greater New York Dental Meeting. The dinner is December 8, Hotel McAlpin, New York. . . . Promotions announced by the Armed Forces include Col. Thomas A. McFall, who has been assigned to direct the dental division of the Army Medical Service Graduate School, in Washington, D. C.; Col. Robert B. Shira, who goes to a post as oral surgeon at Walter Reed Army Hospital, Washington, D. C., and Col. Lowell E. McKelvey, who becomes chief of the oral surgery section at Brooke Army Medical Center, Fort Sam Houston, Texas.

International Correspondence

NEWS FROM GREAT BRITAIN

Sir Wilfred Fish writes that Professor Wilkinson, dean of the Faculty of Dental Surgery of the Royal College of Surgeons, has set up a committee to establish a dental research and education department within the College. The research department will work closely with the basic science departments to relate the basic sciences to dental problems. A director and one or two specialists will be appointed, together with the necessary technical staff, and it is hoped to make a limited number of fellowships available for young graduates, either from Britain or from foreign countries, to work in the department. The first subscription to the research fund was received from an American Fellow, Dr. Lester Cahn.

The regulations for the new postgraduate diploma in orthodontics have been announced. A six months' general postgraduate course and one year of orthodontic study at a hospital are required before the examination may be taken. There are two examinations, a preliminary one in basic sciences related to orthodontics, and a final examination in clinical orthodontics.

The revised regulations for the license in Dental Surgery, which entitles a licentiate to practice in the United Kingdom, contain an ordinance that foreign graduates shall undergo at least a year's training in a British school or hospital before they may present themselves for the final examination.

CHILD DENTAL HEALTH

The report of the Child Dental Health Committee of the British Dental Association has now been published. Recommendations regarding dental service for children are as follows: (a) that the control of the School Dental Service be transferred to the Minister of Health, (b) that improvement in the status and working conditions of dentists in the School Dental Service be effected as soon as possible, (c) that in the School Dental Service full use be made of the service of oral hygienists (for scaling and polishing and educational duties), (d) that orthodontic treatment be made available to all who need it, provided children for whom such treatment is sought receive regular restorative treatment and that their parents guarantee continued cooperation, (e) that priority of treatment be given to the children of those parents who have accepted treatment for them early in school life and who continue to cooperate in maintaining the dental health of their children, (f) that steps be taken to impress on parents and school teachers the value and importance of the supervision of the dental health of children, (g) that close liaison be maintained at all levels between school medical and school dental officers.

NATIONAL HEALTH SERVICE

Jack Gilbert sends the following notes. Four topics of interest to British dentists are: (1) the lack of recruits to the profession, (2) the restoration of the 10 per cent cut in the scale of fees of dentists working in the Health Service, (3) the possibility of dilution of the profession by the introduction of additional classifications of ancillary workers and (4) an increase in the remuneration of consultants in the National Health Service, an increase applied so far only to medical and not to dental consultants.

An official approach has been made to the Minister of Health by the British Dental Association, asking that a committee of inquiry be set up to seek the reasons for the lack of numbers and the lack of quality of potential entrants to the profession. The representatives of the profession are hopeful that something will be done now to examine the whole problem and to suggest possible remedies.

As a direct result of the statistics obtained from the returns to an official questionnaire on the incomes of practitioners working in the General Dental Service, the Minister of Health has been asked to take immediate steps to restore the scale of fees at least to the level that obtained before the 10 per cent reduction was imposed.

Resolutions carried at the annual meeting of the British Dental Association at Blackpool in June, reaffirmed the Association's "absolute objection in principle to the introduction of ancillary dental workers other than those authorized by the 1921 Act." A bill was introduced into Parliament in November 1951

which contained the possibility of an experiment in the use of New Zealand type dental nurses in clinics and the potentiality of the introduction of other classes of dental ancillaries. For a number of reasons the original bill was not passed. It seems practically certain that it will be reintroduced soon.

As a result of recent negotiations, the salaries of both full and part-time consultants working in the hospitals of the National Health Service have been increased. The increases have been applied to those consultants holding medical appointments but have not been implemented in the case of dental personnel. Until this award, medical and dental consultants enjoyed identical rates of remuneration and conditions of service, and members of the dental profession are seriously concerned at the newly created differentiation and the repercussions which would result should it continue.

NEWS FROM SCOTLAND

Professor J. Aitchison sends us news of a meeting July 10th when the Royal Faculty of Physicians and Surgeons of Glasgow awarded the Diploma in Dental Orthopedics to the following distinguished orthodontists: Holly Broadbent, Cleveland; Prof. Sheldon Friel, Dublin, Ireland; Andrew Jackson, Philadelphia; Trevor Johnson, Bristol, England; Charles Kemball, Edinburgh, Scotland; Russell Marsh, London; Charles Nord, Amsterdam, Holland; Rector R. Selmer-Olsen, Oslo, Norway; Ernest Rix, London; Harold Watkin, Liverpool.

ITEMS OF INTEREST

The annual meeting of the British Dental Association is to be known in the future as the Annual Conference, and during the Conference, the meeting at which it was customary to elect the President for the year should be known as the Presidential Meeting. The meeting which considers finance and discusses policy will be called the Annual General Meeting of Members. This is a break with a tradition that has lasted for over 70 years, but it is considered that the new titles are more appropriate and in keeping with present day custom.

The number of dentists and their distribution in the various health services is as follows:

	England and Wales	*Scotland*
Number of registered dentists	12,941	1,762
Estimated number available for practice	11,000	1,500
Number engaged in the General Dental Services	9,500	1,200
Number engaged full time in the Hospital Service	145	25
Number engaged in the Local Health Authority Service	142	15

The British Society for the Study of Prosthetic Dentistry, a comparatively new society in Great Britain, held its annual meeting at the department of dental surgery, University of Edinburgh, September 9. A conference of university teachers of prosthetic dentistry also took place.

At a meeting of the Representative Board of the British Dental Association held in London July 17, R. McIntyre of Alberta, Canada, was officially received and given a welcome. At a special meeting of the American Dental Society of London held August 10 at the Royal College of Surgeons of England, Russell W. Bassett of Beverly Hills, Calif., gave a lecture and clinic entitled "How We Can Improve our Operative Dentistry."

Gerald H. Leatherman, D.M.D., F.D.S.R.C.S.

The Reader Comments

July 10, 1954

Dear Sirs:

A completely false statement has been invented, approved and published by you, and you have falsely, wrongly and damagingly attributed your invented statement to Paul Manning, in THE JOURNAL OF THE AMERICAN DENTAL ASSOCIATION, July 1954, at page 89 of the copy which I receive through holding life membership in Valley District Dental Society and Massachusetts Dental Society.

Your publication that this member told the Committee on Interstate and Foreign Commerce, in Hearings on the bill H.R. 2341 to prohibit fluorination, that "You will become violent," is a falsehood, known or knowable by you to be false when you published it, and known or knowable by you therefore as probably to result in heedless and wanton damage to this member.

Your statement that this member used the word "fluoridation" in the context which you pretend to report truthfully, by placing your own quotation marks about it, is wholly false, as shown by the witness's knowledge of what he did or did not say, as well as by a copy of the official transcript of the oral testimony supplied to Research 44 Associates by representatives of the Press.

You, like others, had access to the official transcript of the Hearings, you had access to Members of the Committee, and you had access to others who were present including respectable reporters; therefore your publication of the false and damaging July report was avoidable by any one of those means. You have access to every one of this member's publications, in not one of which has the statement you have falsely quoted me as making been implied in even the remotest way, and you could have avoided causing damage by that means. You have constructive notice both of the technical falsity of the statement you publicly charged me with having made and also of the exact technical correctness of every one of my publications, and therefore you could have avoided damaging this member merely by picking up a telephone, calling the member and checking the falsity of the unfounded statement approved and published by you.

Therefore I rely upon you to publish immediately a retraction and denial of your July publication, in terms at least equal, as a beginning of the correction owed to me and by way of mitigation of the damage you have already caused. I rely upon you further to cease and desist from this and all other repeated, continuing, baseless and inexcusable attacks upon me and upon my extremely costly defense of my patients, my family and myself, against your persuasions and acts to dominate not only our physiology but also the very words and language with which we make complaint.

Very truly yours,

Paul Manning, D.M.D., LL.B.
Consultant in Physiological Chemistry
46 Hall St., Springfield 8, Mass.
Research 44: The Philosophy of Medical and Chemical Experimentation on Human Beings.

Editor's note:

THE JOURNAL erred in reporting Dr. Manning's warning to the Congressional Committee. According to the official transcript, Dr. Manning's testimony on the subject of bathing in fluoridated water was in part as follows:

"I am convinced of the fairness of this Committee because they are all Americans, Mr. Chairman. But if I can say it without offense, Mr. Chairman and gentlemen, don't soak your bodies in Washington bath water because if you do the inevitable effects of the operation of the laws of physics will come upon you. I am safe in Springfield. I think I can stake my reputation on it. We will never have this experiment performed on us in Springfield.

"I think it is almost a certainty at the present time that, unless this is halted by gentlemen who become interested in it, it will result in open violence in many places at once and provide that little spark which the professors in Harvard Graduate School of Business Administration talk about in their private talks to their alumni. I hope it is not offensive to you, Mr. Chairman, for me to say that.

"I have tried to illustrate by a few words of humility which come from the heart—just don't bathe in it, for your own preservation and the preservation of your services to your country which we value."

Book Reviews

PRACTICAL CLINICAL CHEMISTRY: A GUIDE FOR TECHNICIANS

By Alma Hiller, Ph.D. 226 pages with 13 tables. Index. Price $6.50. Springfield, Ill., Charles C Thomas, 1953.

As the title indicates, this book is designed to provide laboratory directions for a number of conventional procedures in clinical chemistry. It does not discuss the significance of the laboratory findings. Some clinicians may be disappointed by the failure of the author to include one of the more recently developed microprocedures for the determination of urea; this omission precludes a measurement of urea clearance unless the technician obtains directions from another source.

The book is especially useful to the technician because of the inclusion of both detailed directions and outlines of methods. A second copy of the outlines is included on perforated pages in the back of the book and may be detached for routine day-to-day use.

The book may prove very useful in the field for which it is intended. It is less likely to be useful to dental investigators except under special circumstances.

NEW AND NONOFFICIAL REMEDIES 1954

Issued under the direction and supervision of the Council on Pharmacy and Chemistry of the American Medical Association. 609 pages. Index. Price $2.65. Philadelphia, J. B. Lippincott Co., 1954.

This authoritative book is published annually. The metabolic rate, the mechanism of action, the uses, dosages and side effects of a large number of drugs are described. Emphasis is on new preparations, to the almost complete exclusion of many important older drugs, such as morphine, acetylsalicylic acid, procaine and phenol. It is only by such emphasis, however, that *New and Nonofficial Remedies* can be kept compact enough to serve its primary purpose; namely, to provide reliable and readily available information concerning new remedies not yet described in official compendia.

Thirty-eight new monographs have been added and ten have been deleted. Many sections of the book have been extensively revised. Dentists may be especially interested in the new monographs dealing with absorbable gelatin film, antagonists for curariform drugs, hydrocortisone, benzathine penicillin G, chloroprocaine penicillin O, aluminum penicillin, erythromycin and neomycin sulfate. The descriptive portion of *N.N.R.* has been revised also. More attention is given to properties such as color, odor, physical state, taste and solubility. Commercial products accepted currently by the Council on Pharmacy and Chemistry are listed at the end of each descriptive monograph.

N.N.R. is a suitable reference and supplemental textbook for students and practitioners in dentistry, medicine and pharmacy. In order to derive the maximum benefit from the book, the latest edition should always be available. The low cost makes a new copy each year a practical investment.

THE SCIENCE OF DENTAL MATERIALS

By Eugene W. Skinner, Ph.D. Fourth edition. 456 pages with 33 illustrations. Index. Appendix. W. B. Saunders Co., Philadelphia, 1954.

This fourth edition of a book long recognized as the leading reference and textbook on dental materials brings the reader abreast of the advances made in recent years. Skinner has reviewed both the dental and chemical literature most thoroughly and has presented the current information in an unbiased manner.

More emphasis has been placed on the practical application of the basic principles than was done in earlier editions. It must be recognized that dental materials are changing so rapidly that some of the conclusions and data presented may soon become obsolete. However, the fundamentals discussed in this book should give the dentist the background necessary to cope with future developments.

The 33 chapters are adequately illustrated. The new sections dealing with the self-curing resins for restorative and prosthetic dentistry, hydrocolloid impression materials and the new casting technics are especially well done. At the same time, the older materials have not been neglected. For example, the reader will find informative new additions to the chapters on amalgam, gypsum products, base metal alloys and porcelain.

Research methods for dental materials are fully described, and the appendix includes the complete American Dental Association specifications. Although teachers will probably not wish to use the same order of presentation

as Skinner, the book should be required reading for all dental students.

The clinical success of all dental materials is dependent on a thorough knowledge of their basic chemical and physical properties and the influence of manipulative variables on these properties. Thus this book is essential to the dental library.

Ralph W. Phillips

REVIEW OF PHYSIOLOGICAL CHEMISTRY

By Harold A. Harper, Ph.D. Fourth edition. 329 pages with illustrations. Index. Price $4.00. Los Altos, Calif., Lange Medical Publications, 1953.

The first chapter deals with physical chemistry in sufficient detail for students who have not studied the subject. The biochemical material is presented clearly in its various applications for medical practice. Whole chapters are devoted to a discussion of blood and urine but only a half page to saliva.

Information of specific use for dentists is disappointingly meager. Calcium, phosphorus and fluorine are cited as constituents of bones and teeth. The author makes the usual mistake of failing to recognize that dental enamel is not bone either in origin or composition. The fact that fluorine in too great concentration produces mottled enamel is given prominence over the much more important fact that fluorine leads to the formation of enamel resistant to dental caries. It is stated that fluorine is applied topically "to the teeth during the developmental stages," and it is assumed that maturation of enamel is the only stage of development remaining when fluoride is topically applied. No apparent distinction is made between fluoride in the blood at 0.1 ppm level and fluoride topically applied at 10,000 ppm.

The composition of enamel and dentin is given as in current textbooks with no indication that the fluorine content varies widely. Radioactive isotopes are discussed under "metabolism of teeth," which classification may imply to the unwary that enamel "metabolizes" elements that only participate in a purely nonvital exchange.

Gerald J. Cox

PHARMACOLOGY IN CLINICAL PRACTICE

By Harry Beckman, M.D. 839 pages with 152 illustrations. Index. Price $12.50. Philadelphia, W. B. Saunders Co., 1952.

Perhaps the most striking characteristic of this book is its difference from the conventional type of pharmacology textbook. Those who are familiar with *Treatment in General Practice*, an earlier volume by the same author, will recognize many similarities between the two books. In fact, the reader may gain the impression that outside of the inclusion of new material, the principal change is the transfer of some names of diseases from the table of contents to the index and the transfer of some drug names from the index to the table of contents.

Included is a twelve page subsection on dentistry. More than a cursory survey of the various items is precluded as so many subjects are condensed into this small section. For this reason, one may expect these pages to be more useful to the medical student than to the dental student or dentist. The short subdivisions on dental caries, oral hygiene and the dental uses of fluorides give the impression of a better perspective than the subdivisions on periodontal and pulpal infections.

In this reviewer's opinion, the book would have been improved by consistent use of the generic names of drugs rather than the use of an almost indiscriminate mixture of generic and trade names. This criticism does not apply to the second section of the book, which consists of a compendium of drugs.

Dentists who found *Treatment in Dental Practice* a useful reference volume will find this book equally useful.

SURGICAL INFECTIONS: PROPHYLAXIS—TREATMENT—ANTIBIOTIC THERAPY

By Edwin J. Pulaski, M.D. 332 pages. Index. Price $7.75. Springfield, Ill. Charles C Thomas, 1954.

The author states that antibiotic therapy is an adjunct to and not a substitute for sound surgical measures. The first 100 pages are devoted to a lucid discussion of antibiotic therapy with precise information regarding the characteristics, dosages and clinical application of each of the antibiotic agents presently available. The author says that approximately 40 per cent of all disease conditions respond more or less effectively to antibiotic therapy.

Chapters on the management of surgical infections, specific infections, and regional infections and wounds give information on the selection and use of antibiotics as an adjunct to suitable surgical procedures.

There are only minor references to infections of the teeth and contiguous tissues, but the precise and excellent exposition of antibiotic therapy recommends this book to every practicing dentist.

Charles W. Freeman

Current Literature

CANCER OF THE TONGUE, MOUTH, AND PHARYNX

Marion H. Russell. Brit. Med. J. Feb. 20, 1954, p. 430.

This study was made ten years after the treatment of over 2,000 patients with cancers of the tongue, mouth and pharynx at the Christie Hospital and Holt Radium Institute, Manchester, England. The patients were treated with radium or roentgenotherapy during the years 1932 to 1942, inclusive.

The results of this study show that the response to treatment is much better for women than for men. Postoperative mortality, recurrence rate and incidence of lymphatic spread were all lower for women than for men.

Since sex differences do exist, failure to state the sex and age of patients in presenting the results of treatment of malignant disease may result in fallacious deductions when comparisons are being made between different groups.

Failure to keep this sex difference in mind may conceivably be the cause of some misinterpretation, since a higher survival rate attributed to improved technic may be merely the result of differences in the sex ratio in the sample.

Robert P. Lanfranchi

INTERNAL WIRE PIN FIXATION IN COMPLICATED FRACTURES OF JAW AND FACIAL BONES

James Barrett Brown and Minot P. Fryer, J.A.M.A. 155:828 June 26, 1954.

Internal wire pin fixation of a severe facial fracture at the time of primary repair is important in the avoidance of the use of complicated external appliances. The repair of soft parts and underlying bony support of the face should be done as soon as the patient's general condition permits. The alignment of the fragments is necessary before wire pin stabilization. In the mandible, internal wire stabilization is done with 0.05 to 0.08 inch Kirschner wire driven across the fracture site and below the nerve canal by means of a power drill. An internal wire is indicated if there is comminution of the bone, if the injury is in an area of frequent non-union, in the edentulous mandible or if there has been loss of a section of the mandible.

Fractures of the upper alveolar arch and palate can be immobilized by driving wire pins from a solid into a loose portion of bone. If no point in the vicinity is stable, the internal wire binds the loose fragments together and lends enough stability for union.

The internal wire can help hold a fractured and displaced zygoma by cantilever action after elevation and alignment of the loose zygoma when the opposite sound zygoma is used as a point of fixation.

In bilateral fracture dislocation of the zygoma, with comminution of all attachments, reduction of the larger fragments and fixation by an internal wire driven across the face may give a foundation for fixation of smaller parts. Additional pins can then be used to achieve further reduction and stabilization of fragments.

Herbert J. Bloom

JOURNAL OF DENTAL RESEARCH

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USE OF THE GERMFREE ANIMAL TECHNIC IN THE STUDY OF EXPERIMENTAL DENTAL CARIES. I. BASIC OBSERVATIONS ON RATS REARED FREE OF ALL MICROORGANISMS

Frank J. Orland, J. Roy Blayney and R. Wendell Harrison, p. 147.

Specially constructed enclosures free of all detectable microorganisms were used for maintaining rats for extended periods of time. Observations indicated that 22 rats (Rattus norvegicus albinus) when reared germfree did not develop caries in their molar teeth even on a microscopic level, although these animals ingested the same kind of diet which promoted abundant carious lesions in 38 out of 39 conventional control rats harboring the usual microbic flora. On the basis of this negative but unequivocal experimental evidence, it was concluded that carious lesions could not develop in the absence of microorganisms.

THE EFFECTS OF A HIGH CARBOHYDRATE DIET ON THE TEETH OF PARABIOSED ALBINO RATS

Benjamin B. Kamrin, p. 175.

Ten pairs of parabionts were fed a balanced diet and were used as control animals, and 20

pairs of parabionts were fed the experimental diet of a 50 per cent by volume mixture of refined dextrose and the balanced diet. Pairs of both groups were killed at varying intervals, and the jaws were removed and fixed in 10 per cent Formalin. The presence of caries was determined under the dissecting microscope by means of a sharp probe and confirmed by sectioning. The first group showed a low caries incidence (1 pair); in the second group all the animals had carious mandibular molars after 46 days on the diet.

In those pairs in which parabiosis was successful, as evidenced by (1) normal physical growth, (2) skin union with complete obliteration of the suture line and (3) uniform hair growth, there was an equal and similarly patterned mandibular molar caries incidence in each parabiont.

It is concluded that pairs of albino rats in successful parabiosis constitute a well-controlled system for the investigation of factors affecting the incidence of dental caries.

A METHOD OF CULTIVATING TOOTH GERMS IN CARREL FLASKS

Dorothy F. Mardfin and William Lefkowitz, p. 181.

Cultivation of tooth germs by means of the hanging drop, the watch crystal and the depression slide technics has been reported. The Carrel Flask method was successfully used in the present study and provides a simple technic for use in a small tissue culture laboratory.

Glassware was prepared with a detergent. The final rinse was made in demineralized water. Tyrode's solution was prepared from stock solutions with sodium bicarbonate and glucose, freshly added. Lyophylized plasma provided the coagulum, and the embryo extract was freshly prepared.

Histological processing of the minute explant was achieved by placing it in a perforated tube which rested in a beaker. Solutions were changed by pipetting without disturbing the tissue. Orientation of the specimen was achieved by placing it in a concavity prepared in a paraffin block. Melted paraffin was then added.

CULTIVATION OF RAT MOLAR TOOTH GERMS IN CARREL FLASKS. I.

William Lefkowitz, Dorothy F. Mardfin and Charles F. Bodecker, p. 189.

Forty sections of rat embryo mandibles or maxillas containing tooth germs were cultivated. The explants ranged from 18 to 21 days embryonic age. In all cases the coagulum was chicken plasma with either rat or chick embryo extract. The explants degenerated in the central region, although survival was better with rat embryo extract.

A total of 103 dissected tooth germs were similarly studied. Degeneration occurred with the chick embryo extract. When rat embryo extract was used, cultivation of dissected tooth germs of 18 to 21 days embryonic age was successful up to 20 days in the flask. No transfers were made. Approximately 2 days' development occurred in 6 days of cultivation. Further *in vitro* culture resulted only in growth and survival.

DISSECTION OF RAT MOLAR TOOTH GERMS

William Lefkowitz and Dorothy F. Mardfin, p. 201.

The sterile technic of dissection of rat molar tooth germs is a necessary prerequisite to their *in vitro* culture. All tooth germs were dissected from rat embryos of known age.

The entire procedure was performed under a glass canopy. Blocks of tissue containing the tooth germs were dissected grossly. Removal of the tooth germs was done at 30X magnification with two-wheeler discission knives. By the use of the oral mucosa as a hinge, the bony plates were separated. The best results were obtained from 19 day embryos; 18 and 20 day embryos provided good explants. At 17 and 21 days the results were poor.

STUDIES ON PHYSICOCHEMICAL PHENOMENA RELATED TO DENTAL CARIES. I. THE EFFECT OF SUGAR ON THE RATE OF DIFFUSION OF HYDROGEN ION

B. K. Forscher and L. S. Fosdick, p. 206.

The rate of diffusion of hydrogen ions through a semipermeable membrane was studied under varying conditions of sugar concentration. It was found that the rate of diffusion of the hydrogen ion was decreased in the presence of sugar and that the decrease in rate of diffusion was inversely proportional to the concentration of the sugar.

STUDIES ON PHYSICOCHEMICAL PHENOMENA RELATED TO DENTAL CARIES. II. THE EFFECT OF SUGAR ON THE RATES OF DIFFUSION OF CALCIUM AND PHOSPHATE IONS

L. S. Fosdick and B. K. Forscher, p. 212.

A study was made of the effect of sugar on the rate of diffusion of calcium and phosphate ions through a semipermeable membrane. The

calcium and phosphate ions were generated by exposing tricalcium phosphate suspension to attack by hydrogen ions. It was found that the rates of diffusion of calcium and phosphate ions were decreased in the presence of M sucrose solution. The initial rate of appearance of calcium was higher than that of phosphate, but the calcium: phosphate ratio approached the theoretical value of 1.5 with time.

THE FORMATION OF EARLY CARIOUS LESIONS IN DENTAL ENAMEL. PART I

H. R. Sullivan, p. 218.

In order to avoid the development of artefacts in preparations of dental enamel, a series of early carious lesions were examined by reflected light microscopy. Unaffected enamel was not stained by such dyes as alizarin red S or methyl green, whereas carious lesions in the enamel stained quite readily. These results would indicate that the enamel structure has been so changed that carious areas have become more permeable to such chemicals. It would seem that in the structure of normal enamel the calcium is so bound that it is incapable of reacting with the dyes, but the formation of the red stain by alizarin red S in carious lesions would indicate that here the calcium was in a more available, or even a free, form. This result suggests that at least a partial decalcification of the region is one of the earliest changes which occur in the formation of carious lesions.

The lesions appeared conoidal in longitudinal section and rectangular in transverse section, thus possessing a shape similar to that of a wedge. The deepest parts of the lesions bore a relationship to the Hunter-Schreger lines, and the striae of Retzius appeared to have a strong influence on the general shape of the lesions. The earliest sign of the carious process appeared to be limited to the substance between the prisms. There was no indication whether the organic material in the enamel had been affected or not.

THE FORMATION OF EARLY CARIOUS LESIONS IN DENTAL ENAMEL. PART II

H. R. Sullivan, p. 231.

The permeability of the enamel, after being subjected to acid, increases noticeably. Such affected areas stain a bright red with aqueous solutions of alizarin red S, the first substance to be affected being the prism sheath, followed by the interprism substance and, finally, by the body of the prism. Ninhydrin, Morgan-Elson and Hotchkiss reactions indicated that the protein structure of enamel is not broken down by decalcification by acid but that it could be destroyed by boiling in strong acid. A mucopolysaccharide was demonstrated in the normal enamel. Normal enamel was also shown to be permeable to solutions of silver nitrate, which penetrated along paths similar to those followed by the penetration of acids. These investigations offer some indication as to the method of formation of a carious lesion.

IMPORTANCE OF TYPE OF DIET DURING THE SUCKLING PERIOD ON THE INCIDENCE OF EXPERIMENTAL DENTAL CARIES IN RATS

Joseph C. Muhler, p. 245.

Newly erupted teeth are particularly affected by a cariogenic diet. Evidence was supplied by the following experimental results: (a) There was a higher incidence of caries in the teeth of rats fed on a coarsely ground corn diet as compared with that in the teeth of control animals which were given a finely ground low cariogenic diet until the thirtieth day of age and then were fed the coarsely ground corn diet. (b) Apparent strain differences in rats were shown to be due to differences in the diet during the first five weeks. When a low-cariogenic diet was fed during the first four weeks, the rats had a rather low incidence of dental caries even when a coarsely ground corn diet was fed for 140 days. Stannous fluoride afforded more protection against caries in the second generation than did either sodium fluoride or stannous chloride, but the degree of protection was considerably less than the protection afforded parents (first generation) receiving similar fluoride supplements.

EXPERIMENTAL CARCINOGENESIS OF THE CHEEK POUCH OF THE SYRIAN HAMSTER

John J. Salley, p. 253.

A study to determine the susceptibility of the epithelium in the cheek pouch of the Syrian hamster to chemical carcinogenesis was carried out on 36 animals. The animals were divided into two series according to the solvent used. Series A, for which acetone solvent was used, consisted of three groups; the animals in Group I were given 9,10-dimethyl-1,2-benzanthracene; those in Group II 20-methylcholanthrene; those in Group III 3,4-benzpyrene. Series B, for which benzene solvent was used, was similarly divided into Groups IV, V, and VI, which received the same compounds and in the same order.

Each group consisted of six animals equally divided as to sex. A 0.5 per cent solution was used in each group and was painted on the

epithelial surface of the pouch three times a week for 16 weeks. The animals were observed for an additional nine weeks. Results observed in the surviving animals were as follows: Group I—5 survivors, all with malignant tumors, onset in 7 weeks; Group II—5 survivors, 2 with carcinoma, 2 with benign tumors, 1 with no tumor, onset in 25 weeks; Group III —5 survivors, 4 with carcinoma, 1 with benign tumor, onset in 16 weeks; Group IV—4 survivors, 3 with carcinoma, 1 with no tumor, onset in 8 weeks; Group V—3 survivors, 1 with benign papilloma, 2 with no tumor, onset in 25 weeks; Group VI—4 survivors, none with tumors. The results indicate that the hamster pouch may serve as a useful tool in studying initiation, development and metabolism of oral carcinoma, because of its ready adaptability to *in vivo* microscopic observation.

THE INFLUENCE OF INJURY TO THE PERIODONTAL MEMBRANE ON THE SPREAD OF GINGIVAL INFLAMMATION

Luz C. Macapanpan and Joseph P. Weinmann, p. 263.

The spread of local gingivitis into periodontal membrane damaged during tooth movement was studied in serial histologic sections of the molar teeth and supporting tissues of 35 male young adult albino rats. Tooth movement was effected by the insertion of a piece of rubber dam between the upper right first and second molars. The rubber dam acted also as a foreign body and caused papillary gingivitis.

Tooth movement resulted in injury to the periodontal membrane on both pressure and tension sides. This injury consisted, on the pressure side, of hyalinization and, on the tension side, of an unraveling of the "spliced" single fibers of the alveolodental ligament (periodontal fiber bundle).

Damage to the periodontal membrane on the tension side diminished the resistance of normal periodontal membrane and permitted an infiltration from a coexistent gingival inflammation. The experimental results warrant the statement that traumatism of the periodontal membrane will not by itself cause periodontitis but will merely facilitate and direct the spread of an already present gingival inflammation into the adjacent supporting tissues injured by tension.

HISTOCHEMICAL EVALUATION OF GINGIVAL HEALING IN EXPERIMENTAL ANIMALS ON ADEQUATE AND VITAMIN C DEFICIENT DIETS

Samuel S. Turesky and Irving Glickman, p. 273.

Normal gingival healing and gingival healing in acute Vitamin C deficiency were studied by the Lillie histochemical technic. In 44 guinea pigs, some on adequate and some on Vitamin C-deficient diets, the ground substance, basement membrane and glycogen distribution in healing gingiva, after gingivectomy, were evaluated in biopsy specimens. In cases of acute Vitamin C deficiency, the rate of gingival healing was retarded, surface inflammation persisted, and ground substance formation and maturation of basement membrane were retarded.

THE RELATIONSHIP BETWEEN DESIGN AND CUTTING EFFICIENCY OF DENTAL BURS

E. E. Henry and F. A. Peyton, p. 281.

It was the purpose of this study to determine some of the factors of design which influence the cutting efficiency and the functional life of the steel and carbide dental bur. Thirteen different brands of no. 557 steel and carbide burs were obtained, and nine different brands of no. 37 steel and carbide burs were used in the study. These burs were examined for variations in basic design: bur tooth angles, chip clearance space, efficiency and comparative life values.

Little effort was made in this study to correlate completely all the basic design factors with the effectiveness and resistance of the bur to dulling. Some correlations appear quite evident, however. In general, the burs with the more negative rake angle seem to be the least effective in their cutting action. At the same time, they appear to resist dulling to the greatest degree. It is believed that the basic design of the bur is of great significance, and more study is being given to this problem.

Deaths

Aaron, William E., San Francisco; Chicago College of Dental Surgery, Loyola University, 1906; died May 25; aged 75.

Abbott, Rush P., West Point, Miss.; School of Dentistry, Vanderbilt University, 1903; died in June; aged 76.

Alexander, Albert A., New York; College of Dental and Oral Surgery, New York, 1911; died June 2; aged 65.

Bailey, Roy E., Pontiac, Mich.; College of Dental Surgery, University of Michigan, 1894; died May 21; aged 83.

Barnett, John F., Elmira, N. Y.; Department of Dentistry, Starling-Ohio Medical College, 1908; died June 14.

Bell, Willard S., South Ozone Park, N. Y.; School of Dentistry, University of Buffalo, 1918; died June 11; aged 58.

Berman, Alvin H., Baltimore; Baltimore College of Dental Surgery, 1921; died May 18; aged 59.

Boone, Edgar L., Spokane, Wash.; Baltimore College of Dental Surgery, 1902; died May 28; aged 79.

Borja, Nemesio B., Honolulu, T. H.; College of Physicians and Surgeons, San Francisco, 1927; died June 7; aged 57.

Bornmann, Carl F., Brooklyn; New York College of Dentistry, 1911; died June 6; aged 64.

Bowler, Edward V., Waltham, Mass.; Dental School, Harvard University, 1914; died April 28; aged 60.

Bragg, Henry W., Cambridge, Mass.; Boston Dental College, 1899; died June 12; aged 77.

Brands, Robert J., Hoboken, N. J.; School of Dentistry, University of Pennsylvania, 1914; died June 11; aged 60.

Brettschneider, Leonard M., Bronx, N. Y.; College of Dentistry, New York University, 1948; died May 14; aged 29.

Brown, Frederick, Worcester, Mass.; died May 1; aged 74.

Burfeind, William M. H., San Francisco; Baltimore College of Dental Surgery, University of Maryland, 1893; died May 15; aged 84.

Carfagni, Frederico R., Redwood City, Calif.; College of Physicians and Surgeons, San Francisco, 1917; died June 5; aged 58.

Carnahan, John R., New Albany, Ind.; Indiana Dental College, 1909; died February 8; aged 67.

Carter, Otto S., Galliopolis, Ohio; College of Dentistry, Ohio State University, 1921; died May 2; aged 55.

Chambers, William K., Pasadena, Calif.; Cincinnati College of Dental Surgery, 1896; died June 14; aged 78.

Chang, Kwai Lum, Honolulu, T. H.; Chicago College of Dental Surgery, Loyola University, 1918; died May 4; aged 57.

Coene, Harry C., New Brighton, Pa.; School of Dentistry, University of Pittsburgh, 1931; died May 10; aged 55.

Cook, Earle S., Inglewood, Calif.; College of Dentistry, University of Southern California, 1928; died May 28; aged 50.

Corwin, Cecil, Hayward, Calif.; College of Dentistry, University of California, 1891; died May 14; aged 82.

Cumming, Clarence E., Gardner, Ill.; Lincoln Dental College of Cotner University, 1908; died March 1.

Cummings, Joseph L., Soldiers Grove, Wis.; Chicago College of Dental Surgery, Loyola University, 1915; died May 7; aged 62.

Danek, David H., Chicago; Dental School, Northwestern University, 1905; died May 19; aged 72.

Danforth, Edward R., Indianapolis; Dental School, Northwestern University, 1907; died May 24; aged 72.

Dehey, Peter A., Northampton, Mass.; College of Dentistry, Ohio State University, 1912; died June 10.

Dillinger, Ray L., St. Louis; School of Dentistry, St. Louis University, 1926; died March 28; aged 54.

Dillon, Thomas F., Cicero, Ill.; School of Dentistry, St. Louis University, 1921; died July 5; aged 55.

Doyle, Edward J., Philadelphia; School of Dentistry, Temple University, 1918; died May 24; aged 64.

Englander, Louis, Philadelphia; Medico-Chirurgical College of Virginia, 1903; died May 12; aged 75.

Farnum, Stanley A., Cassopolis, Mich.; College of Dental Surgery, University of Michigan, 1896; died June 2; aged 79.

Featherston, William B., Little Rock, Ark.; College of Dentistry, University of Tennessee, 1946; died June 2; aged 34.

Galbraith, Israel D., Kansas City, Mo.; Western Dental College, Kansas City, 1919; died April 9; aged 67.

Galen, Robert R., Pittsburgh; School of Dentistry, University of Pittsburgh, 1917; died June 8; aged 63.

Gerrish, Walter E., Naugatuck, Conn.; New York College of Dentistry, 1888; died February 14; aged 87.

Glennon, Walter H., Columbus, Ohio; Department of Dentistry, Starling-Ohio Medical College, 1913; died May 23; aged 62.

Griffith, William R., Altoona, Pa.; Pennsylvania College of Dental Surgery, Philadelphia, 1908; died May 13; aged 71.

Hallock, Paul, Tacoma, Wash.; Chicago College of Dental Surgery, Loyola University, 1908; died June 7; aged 68.

Hankinson, Marcus C., Brooklyn; New York College of Dentistry, 1894; died June 17; aged 79.

Harlow, Charles D., Seattle; died June 11; aged 56.

Harlow, Lloyd N., St. Petersburg, Fla.; College of Dentistry, University of Nebraska, 1917; died May 30; aged 57.

Hegge, Edward N., Hatton, N. D.; Dental School, Northwestern University, 1903; died April 26; aged 82.

Heinemann, Frederick W., Milwaukee; Dental School, Northwestern University, 1896; died May 23; aged 79.

Helfant, Jackiel M., Astoria, N. Y.; New York College of Dentistry, 1914; died May 12; aged 66.

Hempel, Joseph T., Rochester, N. Y.; School of Dentistry, University of Pennsylvania, 1914; died June 4; aged 67.

Hickey, William F., Covington, Ky.; Ohio College of Dental Surgery, University of Cincinnati, 1925; died May 18; aged 56.

Hinchman, Frank B., Muskegon, Mich.; Dental School, Northwestern University, 1891; died May 11; aged 85.

Hirsch, Simon F., Cleveland; College of Dentistry, Western Reserve University, 1908; died May 6; aged 77.

Hoesly, Henry, New Glarus, Wis.; Chicago College of Dental Surgery, Loyola University, 1900; died May 12; aged 78.

Holcomb, Frederick B., Cherry Creek, N. Y.; College of Dental Surgery, University of Michigan, 1901; died May 15; aged 81.

House, Clarence E., Dorchester, Mass.; Dental School, Tufts College, 1909; died May 4; aged 67.

Hunt, Frederick L., Asheville, N. C.; School of Dentistry, University of Pennsylvania, 1900; died June 2; aged 78.

Hunt, Lester C., Washington, D. C.; School of Dentistry, St. Louis University, 1917; died June 19; aged 61.

Jackson, Ellsworth C., Portsmouth, Ohio; died May 17; aged 89.

Jackson, Garnett L., Houston, Texas; School of Dentistry, Vanderbilt University, 1900; died March 27; aged 77.

Jacobs, Maxwell M., San Francisco; College of Physicians and Surgeons, San Francisco, 1917; died June 2; aged 66.

Johnson, Harrel R., Land O' Lakes, Wis.; College of Dentistry, University of Illinois, 1917; died February 10; aged 62.

Jones, Paul, Philadelphia; Pennsylvania College of Dental Surgery, Philadelphia, 1902; died May 16; aged 73.

Jozefczyk, Andrew M., Hamtramck, Mich.; Chicago College of Dental Surgery, Loyola University, 1919; died May 5; aged 57.

Kelly, Cyril R., Chicago; Chicago College of Dental Surgery, Loyola University, 1920; died May 18; aged 62.

Keasler, Barnett, New York; New York College of Dentistry, 1919; died June 6; aged 58.

Keyser, Herman J., Margate, N. J.; School of Dentistry, Temple University, 1916; died May 31; aged 75.

Kirkpatrick, John C., Johnsonburg, Pa.; School of Dentistry, University of Pittsburgh, 1931; died May 10; aged 46.

Kremer, Leo W., Fort Lauderdale, Fla.; Dental School, Northwestern University, 1914; died May 26; aged 60.

Iverson, Leonard R., Glenwood, Minn.; College of Dentistry, University of Minnesota, 1921; died May 7; aged 56.

Laughlin, Louis B., Vallejo, Calif.; College of Physicians and Surgeons, San Francisco, 1907; died May 28; aged 78.

Lewis, Chauncey G., Delaware, Ohio; Pennsylvania College of Dental Surgery, Philadelphia, 1889; died May 18; aged 86.

Little, William A., Cresson, Pa.; Pittsburgh Dental College, Western University of Pennsylvania, 1908; died May 12; aged 75.

Lurie, Benjamin M., Chicago; Chicago College of Dental Surgery, Loyola University, 1920; died June 23; aged 60.

Lutz, Frank V., Portland, Ore.; School of Dentistry, North Pacific College of Oregon, Portland, 1925; died June 10; aged 51.

Lyon, Claude A., Asbury Park, N. J.; School of Dentistry, University of Pennsylvania, 1915; died June 7; aged 66.

Maney, James P., Oswego, N. Y.; Philadelphia Dental College, 1900; died February 15; aged 77.

Margrave, Alfred B., Wahoo, Neb.; College of Dentistry, Creighton University, 1928; died May 30; aged 50.

Masten, Edward, Middletown, N. Y.; Baltimore College of Dental Surgery, 1913; died May 29; aged 65.

McCallum, John A., Chicago; Chicago College of Dental Surgery, Loyola University, 1916; died June 16; aged 64.

McGlathery, John W., Kansas City, Mo.; Kansas City Dental College, 1910; died April 18; aged 76.

McGuire, Eugene, Phoenix, Ariz.; School of Dentistry, Washington University, St. Louis, 1900; died June 2; aged 82.

McKeown, S. Albert, San Francisco; College of Dentistry, University of California, 1930; died April 7; aged 47.

Miller, Israel S., New York; School of Dentistry, University of Pennsylvania, 1909; died May 21; aged 67.

Millyard, William A., Chicago; Chicago College of Dental Surgery, Loyola University, 1902; died June 15; aged 76.

Morris, Cary B., Clifton Forge, Va.; School of Dentistry, University of Pittsburgh, 1914; died June 3; aged 62.

Murphy, George A., Boston; Dental School, Tufts College, 1906; died June 8; aged 73.

Neil, Frederick A., Kansas City, Mo.; College of Dentistry, University of Iowa, 1908; died April 16; aged 73.

Norton, Oakley W., Rochester, N. Y.; Baltimore College of Dental Surgery, University of Maryland, 1900; died May 24; aged 77.

Oetjen, John H., Jr., Jacksonville, Fla.; School of Dentistry, Loyola University, New Orleans, 1933; died June 3.

O'Hara, Bernard A., Waterbury, Conn.; School of Dentistry, University of Pennsylvania, 1918; died June 21; aged 61.

Osher, Burt T., Estherville, Iowa; Dental School, Northwestern University, 1899; died April 7; aged 78.

Pardee, George L., Franklin, Pa.; Pennsylvania College of Dental Surgery, Philadelphia, 1902; died April 27; aged 76.

Paschal, Karl B., Bedford, Iowa; Dental School, Northwestern University, 1905; died June 21; aged 71.

Payne, James H., San Antonio, Texas; Texas Dental College, Houston, 1908; died February 21; aged 74.

Peebles, Horatio B., Clever, Mo.; Western Dental College, Kansas City, 1906; died March 3; aged 78.

Pertson, Louis A., Los Angeles; College of Dentistry, University of Southern California, 1911; died April 20; aged 75.

Pitcher, Frank C., Sodus Point, N. Y.; Pennsylvania College of Dental Surgery, Philadelphia, 1903; died February 27; aged 74.

Porter, Arch B., Wabash, Ind.; Indiana Dental College, 1913; died February 26; aged 78.

Quay, Walter M., Tiffin, Ohio; Department of Dentistry, Starling-Ohio Medical College, 1913; died May 11; aged 66.

Reese, Ben L., Los Angeles; College of Dentistry, University of Southern California, 1917; died May 22; aged 63.

Roberts, Albert L., Streator, Ill.; Dental School, Northwestern University, 1923; died May 15; aged 55.

Rumbaugh, Roy D., Beaver, Pa.; School of Dentistry, University of Pittsburgh, 1909; died in June.

Schafer, William H., Elkhart, Ind.; Indiana Dental College, 1916; died May 4; aged 69.

Schealer, Roy F., Boyertown, Pa.; Philadelphia Dental College, 1908; died April 6; aged 66.

Scott, Emmett B., East Point, Ga.; Atlanta-Southern Dental College, 1923; died in May; aged 56.

Selman, O. A., Summerville, Ga.; Atlanta Dental College, 1899; died in May; aged 76.

Shadrick, Samuel A., Danville, Va.; Baltimore College of Dental Surgery, Philadelphia, 1896; died March 30; aged 83.

Sharp, James G., Palo Alto, Calif.; College of Dentistry, University of California, 1893; died May 26; aged 86.

Sharp, John H., Ocean City, N. J.; Medico-Chirurgical College of Philadelphia, 1912; died May 30; aged 65.

Shaw, Ernest P., San Antonio, Texas; Atlanta Dental College, 1913; died March 28; aged 62.

Shea, Daniel S., Marathon, Wis.; Dental School, Marquette University, 1923; died May 6; aged 61.

Shummon, Simon B., Slinger, Wis.; Dental School, Marquette University, 1923; died April 21; aged 64.

Simon, Vincent C., New Bedford, Mass.; Dental School, Tufts College, 1908; died May 17; aged 70.

Skraly, Boris H., New York; New York College of Dentistry, 1918; died May 22; aged 71.

Slaff, Samuel, Miami Beach, Fla.; School of Dentistry, University of Pennsylvania, 1916; died May 7; aged 59.

Smith, William D., Philadelphia; died May 3; aged 67.

Strangman, William F., Rockport, Mass.; Dental School, Harvard University, 1906; died June 15; aged 78.

Straub, Charles R., Lakewood, Ohio; College of Dentistry, Western Reserve University, 1928; died May 26; aged 50.

Strusser, Harry, New York; New York College of Dentistry, 1918; died May 17; aged 58.

Terrell, William O., Detroit; Dental Department, Meharry Medical College, 1918; died June 8; aged 60.

Thexton, Richard E., Chicago; Chicago College of Dental Surgery, Loyola University, 1892; died June 15; aged 86.

Tousey, Coleman, Somerville, Mass.; Dental School, Harvard University, 1901; died May 14.

Unthank, Alva H., Fort Wayne, Ind.; Indiana Dental College, 1899; died May 21; aged 80.

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Announcements

MEETINGS OF THE AMERICAN DENTAL ASSOCIATION

Ninety-Fifth Annual Session	Nov. 8-11, 1954	Miami, Fla.
Ninety-Sixth Annual Session	Oct. 17-20, 1955	San Francisco
Ninety-Seventh Annual Session	Oct. 1-4, 1956	Atlantic City, N.J.

MEETINGS OF CONSTITUENT SOCIETIES

State	Date	Place	Secretary	Address
Alabama	Apr. 4, 5, 1955	Birmingham	F. A. Finney, Jr.	1045 Forrest Ave., Gadsden
Alaska			C. J. Pearson	500 K St., Anchorage
Arizona	Apr. 27-30, 1955	Grand Canyon	R. W. Christensen	17 E. Weldon Ave., Phoenix
Arkansas	Apr. 3-6, 1955	Little Rock	D. M. Hamm	Box 89, Clarksville
California	Apr. 16, 1955	San Francisco	L. R. Ludwiggsen	450 Sutter St., San Francisco
S. California	May 9-11, 1955	Los Angeles	J. P. Bowers	124 W. Lime Ave., Monrovia
Colorado	Oct. 3-6	Colorado Springs	W. R. Humphrey	724 Republic Bldg., Denver
Connecticut	May 18-20, 1955	Hartford	E. S. Arnold	37 Linnard Rd., W. Hartford
Delaware	Jan. 12, 1955	Wilmington	R. J. Zurkow	152 S. State St., Dover
District of Columbia			Z. B. Lloyd	2007 R St., N.W., Washington
Florida	Apr. 24-27, 1955	Jacksonville	J. E. Edwards	152 Alhambra Circle, Coral Gables
Georgia	Oct. 10-13	Atlanta	J. W. Yarbrough	Bibb Bldg., Macon
Hawaii	June 15-18, 1955	Honolulu	J. H. Dawe	810 N. Vineyard St., Honolulu
Idaho	May 19-21, 1955	Coeur d'Alene	F. O'Halloran	Box 703, Coeur d'Alene
Illinois	May 9-12, 1955	Peoria	P. W. Clopper	623 Jefferson Bldg., Peoria
Indiana	May 16-18, 1955	Indianapolis	D. C. Barnhill	400 Bankers Trust Bldg., Indianapolis
Iowa	May 1-4, 1955	Des Moines	H. I. Wilson	639 Insurance Exchange Bldg., Des Moines
Kansas	May 15-18, 1955	Kansas City, Mo.	F. A. Richmond	861 Brotherhood Bldg., Kansas City
Kentucky	Apr. 18-21, 1955	Louisville	A. B. Coxwell, Jr.	1976 Douglass Blvd., Louisville
Louisiana	Apr. 13-16, 1955	New Orleans	J. S. Bernhard	2515 Line Ave., Shreveport
Maine	June 23-25, 1955	Rockland	S. M. Gower	Box 27, Skowhegan
Maryland	May 2-4, 1955	Baltimore	E. L. Pessagno, Jr.	415 Medical Arts Bldg., Baltimore
Massachusetts	May 1-4, 1955	Boston	H. E. Tingley	12 Bay State Rd., Boston
Michigan	Apr. 18-20, 1955	Detroit	F. Wertheimer	Michigan Dept. of Health, Lansing
Minnesota	Mar. 28-30, 1955	Minneapolis	C. V. E. Cassel	225 Hamm Bldg., St. Paul
Mississippi	Apr. 24-27, 1955	Jackson	B. A. Cohen	306 Plaza Bldg., Jackson
Missouri	May 15-18, 1955	Kansas City	E. D. Suggett	201 Merchants Bank Bldg., Jefferson City
Montana	May 5-7, 1955	Bozeman	E. G. Vedova	Roundup
Nebraska	May 9-12, 1955	Lincoln	F. A. Pierson	1112 Federal Securities Bldg., Lincoln
Nevada			O. M. Seifert	506 Humboldt St., Reno
New Hampshire	June 12-14, 1955	Whitefield	F. E. Williams	814 Elm St., Manchester
New Jersey	Apr. 18-20, 1955	Atlantic City	J. G. Carr	407 Cooper St., Camden
New Mexico	May 22-25, 1955	Ruidoso	J. S. Eilar	Medical Arts Square, Albuquerque
New York	May 16-18, 1955	New York	C. A. Wilkie	1 Hanson Place, Brooklyn
North Carolina	May 15-18, 1955	Pinehurst	R. D. Coffey	Kibler Bldg., Morganton
North Dakota	May 1-4, 1955	Grand Forks	V. B. Keltgen	517 de Lendrecie Bldg., Fargo
Ohio	Oct. 17-20	Cincinnati	E. G. Jones	185 E. State St., Columbus
Oklahoma	Apr. 20, 1955	Tulsa	S. A. Russman	809 Medical Arts Bldg., Oklahoma City
Oregon	Mar. 7-9, 1955	Portland	T. D. Holder	308 Selling Bldg., Portland
Panama Canal Zone			A. L. Teitel	Box D, U.S. Naval Station, Rodman
Pennsylvania	Oct. 4-6	Pittsburgh	M. D. Zimmerman	217 State St., Harrisburg
Puerto Rico	Jan. 26-29, 1955	San Juan		Box 624, San Juan
Rhode Island	Jan. 1955	Providence	B. C. Friedman	2 Ayrault St., Newport
South Carolina	May 22-24, 1955	Charleston	J. R. Owings	7 Medical Court, Greenville

State	Date	Place	Secretary	Address
South Dakota	May 15-17, 1955	Aberdeen	L. N. Thelen	310A W. 18th St., Sioux Falls
Tennessee	May 8-12, 1955	Nashville	A. M. Ballentine	Pulaski
Texas	May 1-5, 1955	San Antonio	W. Ogle	3607 Gaston Ave., Dallas
Utah	Apr. 21-23, 1955	Ogden	R. C. Daigleish	124 State Capitol Bldg., Salt Lake City
Vermont	May 30-June 1, 1955	Manchester	W. J. Reardon	18 Madison St., Rutland
Virginia	Apr. 29-May 6, 1955	Havana, Cuba	W. T. McAfee	705 Colonial National Bank Bldg., Roanoke
Washington	Mar. 24-26, 1955	Seattle	W. B. Martin	Medical-Dental Bldg., Seattle
West Virginia	July 24-27, 1955	White Sulphur Springs	G. N. Casto, Jr.	710½ Lee St., Charleston
Wisconsin	Apr. 25-27, 1955	Milwaukee	A. E. Kopp	Wells Bldg., Milwaukee
Wyoming	June 16-18, 1955	Cheyenne	T. J. Drew	State Office Bldg., Cheyenne

MEETINGS OF STATE BOARDS OF DENTAL EXAMINERS

State	Date	Place	Secretary	Address
Alabama	June 20-24, 1955*	Birmingham	W. L. McCarty	200 Professional Center, Montgomery
	June 20, 21, 1955†			
Alaska			R. H. Williams	Box 2122, Juneau
Arizona			R. K. Trueblood	107 East A Ave., Glendale
Arkansas	June 20-24, 1955*†	Little Rock	H. O. Weatherly	205 Halter Bldg., Conway
California			T. E. Tilden	Medico-Dental Bldg., Sacramento
Colorado			J. M. Peabody	724 Republic Bldg., Denver
Connecticut			C. G. Brooks	302 State St., New London
Delaware			P. K. Musselman	143 W. Main St., Newark
District of Columbia			W. T. Birthright	Suite 718, 1835 Eye St., N.W., Washington
Florida	July 11-21, 1955*†	Jacksonville	A. W. Kellner	P. O. Box 155, Hollywood
Georgia			M. McNeil	307 First National Bank Bldg., Rome
Hawaii			H. L. Houvener	427 Dillingham Bldg., Honolulu
Idaho			R. E. Blickenstaff	1023 Fourth St., S., Nampa
Illinois			W. A. McKee	503 Wood Bldg., Benton
Indiana	Dec. 6-9	Indianapolis	C. A. Frech	504 Broadway, Gary
Iowa	May 23-27, 1955‡		D. J. FitzGerald	615 Brick & Tile Bldg., Mason City
Kansas	Jan. 24-27, 1955*	Kansas City, Mo.	G. L. Teall	Box 71, Hiawatha
	Jan. 25, 26, 1955†			
Kentucky			R. M. Justice	1330 Central Ave., Ashland
Louisiana			R. C. Steib	833 Maison Blanche Bldg., New Orleans
Maine			R. A. Derbyshire	Box 387, Skowhegan
Maryland	Nov. 29-Dec. 1‡		H. Levin	3429 Park Heights Ave., Baltimore
Massachusetts			G. J. Fink	Rm. 33, State House, Boston
Michigan	Jan. 23-29, 1955	Ann Arbor	J. L. Champagne	3714 W. McNichols Rd., Detroit
	June 5-11, 1955			
Minnesota	Jan. 10-14, 1955*†‡		M. G. Walls	615 Montcalm Place, St. Paul
	June 13-17, 1955*†‡			
Mississippi	Jan. 4-6, 1955	Jackson	J. C. Boswell	508 Lamar Life Bldg., Jackson
	June 21-23, 1955			
Missouri			R. R. Rhoades	414 Central Trust Bldg., Jefferson City
Montana			V. J. Quinn	301 Phoenix Bldg., Butte
Nebraska			H. E. Weber	1210 Federal Securities Bldg., Lincoln
Nevada	Dec. 6	Las Vegas	R. Whitehead	Suite 6, Masonic Temple, Reno
New Hampshire	Dec. 12*	Concord	S. G. Markos	8 Renaud Ave., Dover
New Jersey	Nov. 29, 30*	Philadelphia	W. A. Wilson	150 E. State St., Trenton
	Dec. 1, 2*	Trenton		
	Nov. 29, 30†	Philadelphia		
New Mexico			J. J. Clarke, Sr.	Artesia
New York	Feb. 10, 11, 1955*‡		D. W. Beier	23 S. Pearl St., Albany
	Feb. 15-18, 1955*‡			
	Feb. 10, 1955†‡			
	Feb. 15, 16, 1955†‡			
North Carolina			F. O. Alford	1109 Liberty Life Bldg., Charlotte
North Dakota	June 20-24, 1955	Fargo	A. L. Pushor	Lisbon
Ohio			H. B. Smith	322 E. State St., Columbus
Oklahoma			R. P. Keidel	403 Surety Bldg., Muskogee
Oregon	Dec. 16-18*†	Portland	F. L. Utter	506 Pioneer Trust Bldg., Salem
Pennsylvania			A. M. Stinson	Dept. of Public Instruction, Box 911, Harrisburg

State	Date	Place	Secretary	Address
Puerto Rico			J. Mercado C.	Box 3717, Santurce
Rhode Island			F. M. Hackett	267 Academy Ave., Providence
South Carolina			T. C. Sparks	1315 Pickens St., Columbia
South Dakota			H. T. Aker	Canton
Tennessee			C. R. Aita	619 Bennie Dillon Bldg., Nashville
Texas			R. T. Weber	312 Capital National Bank Bldg., Austin
Utah			D. L. Folsom	1101 First Security Bank Bldg., Salt Lake City
Vermont			P. M. Fitch	Newport
Virginia	June 6-11, 1955* June 6, 7, 1955†	Richmond	J. M. Hughes	715 Medical Arts Bldg., Richmond
Washington			M. L. Mower	National Bank of Commerce Bldg., Olympia
West Virginia			C. A. Laughlin	613 Prunty Bldg., Clarksburg
Wisconsin			S. F. Donovan	Tomah
Wyoming			W. A. Hocker	212 O & S Bldg., Casper

*Dental examination. †Dental hygiene examination. ‡Write to secretary of dental examining board for information on locations of examinations. §Approximate dates—verify with state dental examining board.

MEETINGS OF OTHER ORGANIZATIONS

Name	Date	Place	Secy. or Chm.	Address
American Academy of Dental Medicine	Dec. 5	New York	W. M. Greenhut Secy.	124 E. 84th St., New York
American Academy of Gold Foil Operators	Nov. 6	Miami, Fla.	G. D. Stibbs Secy.	School of Dentistry, University of Washington, Seattle
American Academy of the History of Dentistry	Nov. 5	Miami, Fla.	H. L. Faggart Secy.	2120 Pine St., Philadelphia
American Academy of Implant Dentures	Nov. 6, 7	Miami, Fla.	E. J. Krease Secy.	312 17th St., Denver
American Academy of Oral Roentgenology	Nov. 6	Miami, Fla.	E. A. Bourassa Secy.	1033 Medical and Dental Bldg., Seattle
American Academy of Pedodontics	Nov. 3-5	Miami, Fla.	R. M. Erwin, Jr. Secy.	911 Selling Bldg., Portland, Ore.
American Academy of Periodontology	Nov. 4-6	Miami Beach, Fla.	C. E. Chamberlain Secy.	115 North St., Peoria, Ill.
American Academy of Restorative Dentistry	Feb. 5, 6, 1955	Chicago	A. G. James Secy.	409 N. Camden Drive, Beverly Hills, Calif.
American Association for the Advancement of Science, Section on Dentistry	Dec. 28	Berkeley, Calif.	R. W. Bunting Secy.	2224 Vinewood Blvd., Ann Arbor, Mich.
American Association of Dental Editors	Nov. 6	Miami, Fla.	L. F. Bumgardner Secy.	4-H Doctors Bldg., Charlotte, N.C.
American Association of Dental Examiners	Nov. 5, 6	Miami, Fla.	C. A. Bumstead Secy.	924 Stuart Bldg., Lincoln, Neb.
American Association of Dental Schools	Mar. 21-23, 1955	Chicago	M. W. McCrea Secy.	Baltimore College of Dental Surgery, University of Maryland, Baltimore
American Association of Endodontists	Feb. 5, 6, 1955	Chicago	V. B. Milas Secy.	2559 W. 63rd St., Chicago
American Board of Dental Public Health	Nov. 4, 5	Miami, Fla.	P. E. Blackerby, Jr. Secy.	250 Champion St., Battle Creek, Mich.
American College of Dentists	Nov. 7	Miami, Fla.	O. W. Brandhorst Secy.	4221 Lindell Blvd., St. Louis
American Dental Assistants Association	Nov. 8-11	Miami, Fla.	M. L. Martin Exec. Secy.	410 First National Bank Bldg., LaPorte, Ind.
American Dental Hygienists' Association	Nov. 8-11	Miami, Fla.	M. Swanson Exec. Secy.	1735 Eye St., N.W., Washington, D.C.
American Dental Society of Anesthesiology	Nov. 6, 7	Miami, Fla.	J. H. Mervis Secy.	510 Walnut St., Clairton, Pa.
American Denture Society	Nov. 5, 6	Miami Beach, Fla.	A. L. Roberts Secy.	Aurora National Bank Bldg., Aurora, Ill.
American Institute of Dental Medicine	Oct. 31-Nov. 4	Palm Springs, Calif.	M. G. Lewis Exec. Secy.	2240 Channing Way, Berkeley, Calif.
American Public Health Association	Oct. 11-15	Buffalo	R. M. Atwater Exec. Secy.	1790 Broadway, New York

Name	Date	Place	Secy. or Chm.	Address
American Society of Oral Surgeons	Nov. 3-6	Hollywood, Fla.	R. F. Whalen Exec. Secy.	1112 E. Clay St., Richmond, Va.
Association of American Women Dentists	Nov. 8	Miami, Fla.	M. C. DeRisi Secy.	2800 Woodley Rd., N.W., Washington, D.C.
Chicago Dental Society	Feb. 6-9, 1955	Chicago	K. S. Richardson Exec. Secy.	30 N. Michigan Ave., Chicago
Council on Dental Education, Dental Aptitude Tests	Oct. 1, 2		S. Peterson Secy.	222 E. Superior St., Chicago
Denver Dental Association Midwinter Meeting	Jan. 9-12, 1955	Denver	B. Kletzky Secy.	724 Republic Bldg., Denver
Detroit District Dental Society, Thirteenth Annual Postgraduate Dental Review	Nov. 22, 23	Detroit	A. C. Pringle Chm.	1111 Kales Bldg., Detroit
District of Columbia Postgraduate Clinic	Mar. 13-16, 1955	Washington, D.C.	E. M. Colvin, Jr. Gen. Chm.	1726 21st St., N.W., Washington, D.C.
Fourth National Dental Congress of Peru	Nov. 14-20	Lima, Peru	V. R. Iparraguirre Secy. Gen.	Plaza San Martin 981, Lima, Peru
Greater New York Dental Meeting	Dec. 6-10	New York	M. Purdy Exec. Secy.	Rm. 106A, Hotel Statler, New York
Greater Philadelphia Annual Meeting	Feb. 2-5, 1955	Philadelphia	R. Adams Secy.	337 Bellevue-Stratford Hotel, Broad and Walnut Sts., Philadelphia
Journees Dentaires de Paris	Nov. 24-28	Paris, France	J. Ouvrard Secy. Gen.	33, Av. Pierre, 1er, De-Serbie, Paris
Mid-Continent Dental Congress	Nov. 28-Dec. 1	St. Louis	J. E. Brophy Exec. Secy.	8013 Maryland Ave., St. Louis
Middle Atlantic Society of Orthodontists	Oct. 3-5	Atlantic City, N.J.	G. A. Devlin Secy.	49 Bleeker St., Newark, N.J.
National Board of Dental Examiners	Dec. 6, 7		G. J. Casey Secy.	222 E. Superior St., Chicago
New England Dental Society	Oct. 20, 21	Boston	F. L. Finley, Jr. Secy.	43 Farmington Ave., Hartford, Conn.
Northeastern Society of Orthodontists	Oct. 25, 26	Buffalo	W. J. Prezzano Secy.	Medical Centre, White Plains, N.Y.
Seventh New Orleans Dental Conference	Oct. 24-27	New Orleans	V. B. Marquer Secy.	2213 S. Carrollton Ave., New Orleans
Southern Society of Orthodontists	Oct. 31-Nov. 3	Washington, D.C.	M. D. Edwards Secy.	132 Adams Ave., Montgomery, Ala.
Southwestern Society of Orthodontists	Oct. 10-13	Oklahoma City	F. A. Boyd Secy.	1502 N. Third St., Abilene, Texas

Hotel reservation application

95th Annual Session
American Dental Association
Nov. 8-11, 1954
Miami, Florida

INSTRUCTIONS: Reservations for hotel accommodations may be secured for either Miami or Miami Beach by completing this application and mailing it to: A.D.A. Housing Bureau, 320 N.E. Fifth Street, Miami, Florida.

Be sure to indicate your arrival time in Miami. Reservations will be held only until 6 p.m. of the day you indicate for your arrival in Miami. Failure to notify the hotel of any last minute change in your arrival time may result in cancellation of the reservation.

Names of all persons who intend to occupy the accommodations must be listed on the application.

List four choices of hotels. Confirmation will be sent to the applicant indicating which hotel has accepted the reservation.

Write the A.D.A. Housing Bureau in Miami if you wish to cancel the reservation.

A.D.A. Housing Bureau • 320 N.E. Fifth Street, Miami, Florida

(Please print or type) A.D.A.

Applicant:

Name_____

_____
(Street address) (City) (Zone) (State)

Arrival in Miami_____ a.m. / p.m. Leaving_____

Accommodations:

Hotel_____ Hotel_____
(First choice) (Third choice)

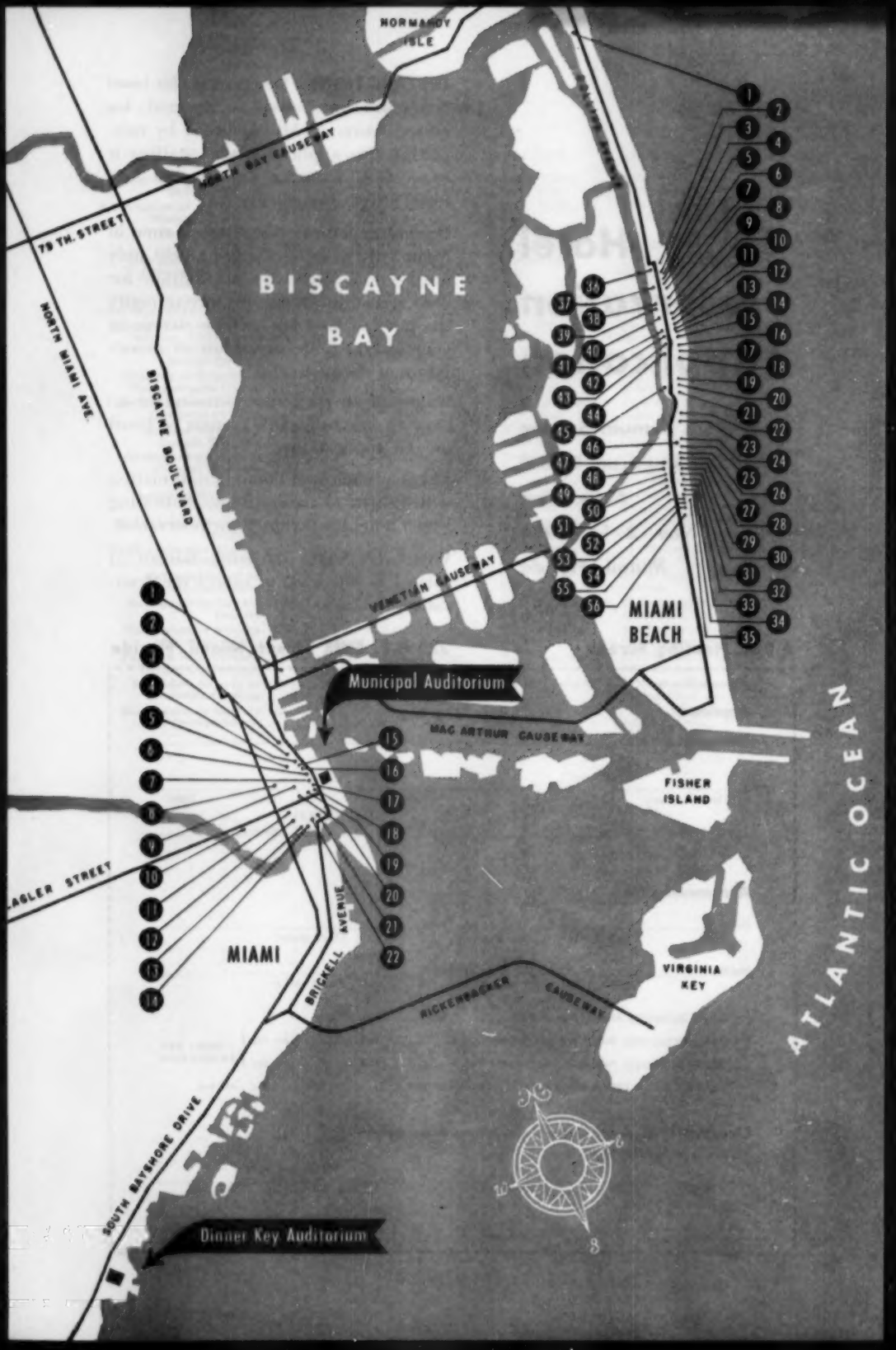
Hotel_____ Hotel_____
(Second choice) (Fourth choice)

☐ Single occupancy, rate to range from $_____ to $_____ per day.
☐ Double occupancy, double bed, rate to range from $_____ to $_____ per day. } 2 names must be listed below
☐ Double occupancy, twin beds, rate to range from $_____ to $_____ per day. }
☐ Suite of_____ rooms, including parlor, rate to range from $_____ to $_____ per day.

Occupants: (use an extra page for listing additional names if necessary)
Room will be occupied by:

_____
(Name) (Address) (City) (State)

_____
(Name) (Address) (City) (State)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MIAMI
BRICKELL AVENUE
RICKENBACKER CAUSEWAY
VIRGINIA KEY
SOUTH BAYSHORE DRIVE
Dinner Key Auditorium

Hotels in **MIAMI**

Key no.	Hotel	Single	Double
2	Alcazar	$5.00	$6.00-$ 7.00
11	Alhambra		7.00
9	Belfort	5.00	6.00- 7.00
16	Berni		5.00- 7.00
5	Biscayne Terrace	8.00	10.00- 14.00
7	Columbus	6.00- 7.00	8.00- 12.00
8	Cortez	4.00	5.00- 7.00
12	Dallas Park		10.00
10	El Comodoro	5.00- 6.00	8.00- 12.00
15	Everglades	5.00- 8.00	8.00- 12.00
17	Leamington		6.00- 7.00
3	Liberty		6.00
18	McAllister	5.00- 7.00	8.00- 12.00
6	Miami Colonial	5.00- 6.00	8.00- 10.00
19	Paramount		6.00- 8.00
21	Patricia	5.00	7.00
4	Plaza	5.00	7.00- 8.00
20	Ponce de Leon	8.00	10.00- 12.00
14	Robert Clay	5.00- 6.00	5.00- 7.00
22	Towers	4.00	6.00
13	Tuttle		6.00
1	Venetian	5.00- 6.00	6.00- 8.00

Hotels in **MIAMI BEACH**

Key no.	Hotel	Single	Double
7	Atlantic Towers	$ 7.00	$ 9.00-$
21	Atlantis	5.00	6.00
22	Belmar	8.00	10.00- 12.00
20	Billows		6.00
9	Cadillac		6.00- 8.00
43	Capri	6.00	8.00
11	Caribbean	6.00	8.00
50	Catalina		5.00- 6.00
40	Claridge	3.00	5.00
37	Continental	4.00	5.00
27	Cromwell	6.00	8.00
38	Croydon Arms	5.00	6.00
45	Del Prado	5.00	6.00- 8.00
53	Delano		10.00
56	di Lido		10.00- 14.00
47	Dorchester	4.00	5.00
41	El Morocco	5.00	8.00
44	Embassy	6.00	8.00
4	Empress		10.00- 14.00
51	Gale	4.00	5.00
5	Good	4.00- 6.00	7.00- 11.00
8	Lord Tarleton	10.00	12.00
49	Maxine		6.00
1	Monte Carlo	8.00-12.00	9.00- 13.00
54	National		6.00
30	Nautilus		15.00
12	Ocean Grande	4.00	5.00- 7.00
13	Patrician	5.00	6.00
10	President Madison	$7.00	$8.00
23	Promenade	8.00	10.00- 12.00
42	Rendale	4.00	5.00
32	Richmond	5.00	6.00
16	Robert Richter	6.00	8.00
25	Roney Plaza		10.00- 14.00
55	Sagamore		8.00
52	San Juan	5.00	6.00
6	San Marino	8.00	10.00
18	Sans Souci		10.00- 14.00
17	Saxony		12.00
34	Seacomber		10.00
26	Sea Gull		8.00- 10.00
31	Shelbourne	8.00	10.00- 12.00
48	Shelby	4.00	5.00
29	Shore Club		8.00- 12.00
14	Shoremede	8.00	10.00
2	Sorrento	8.00	10.00
33	South Seas	5.00	6.00
3	Sovereign		10.00
35	Surfcomber	8.00	10.00
36	Surrey		8.00
46	Town House		6.00
24	Traymore	5.00- 8.00	6.00- 10.00
19	Triton	4.00	6.00- 8.00
28	Vanderbilt	6.00	8.00
15	Versailles		8.00- 12.00
39	Wilshire		4.00

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Reducing Agent, each dropper bottle ..... .50
1 cc. ampoules, 1 doz. in plastic package $4.50

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Fig. 1

Fig. 2

Fig 3

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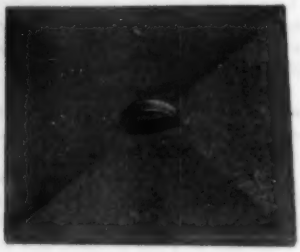

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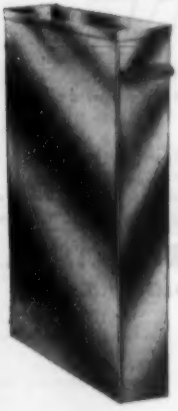

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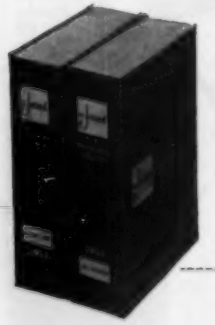

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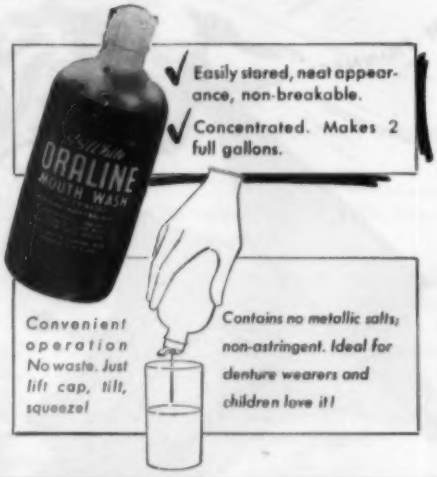
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Edited by ARTHUR B. GABEL, A.B., D.D.S., M.A.

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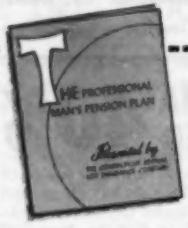

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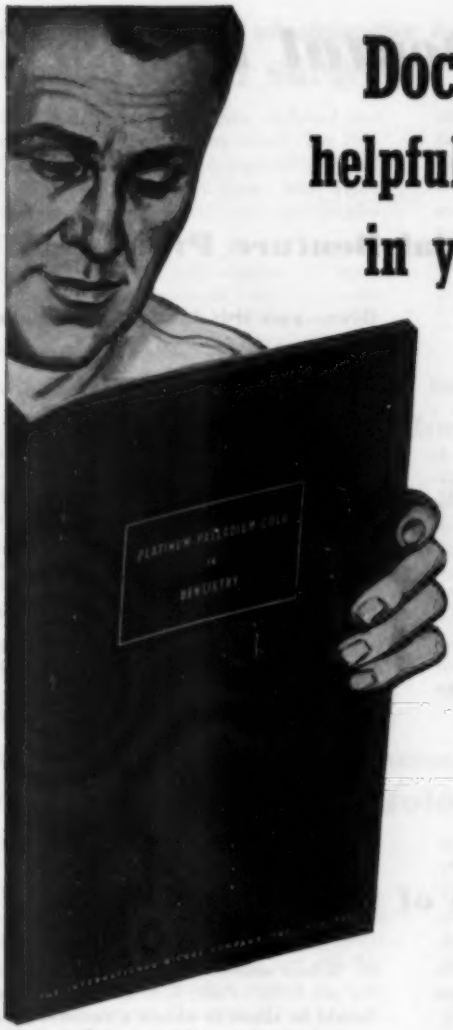

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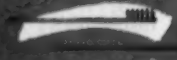

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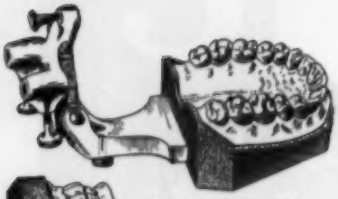

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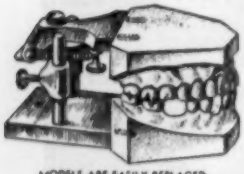

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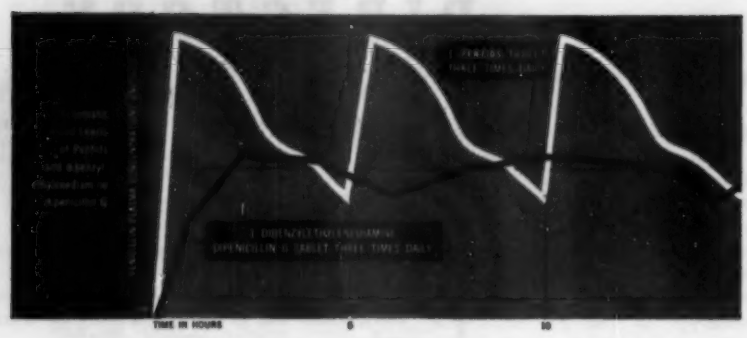

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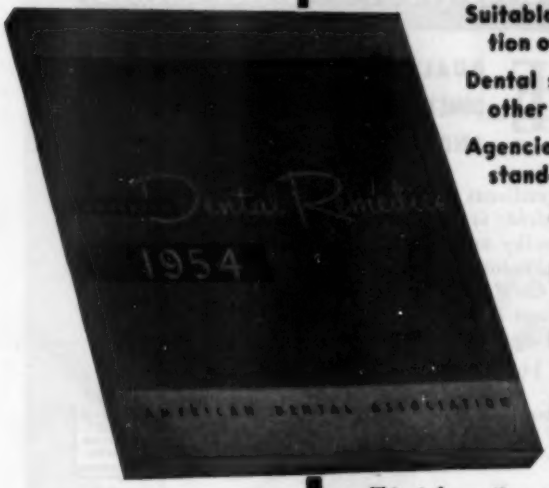

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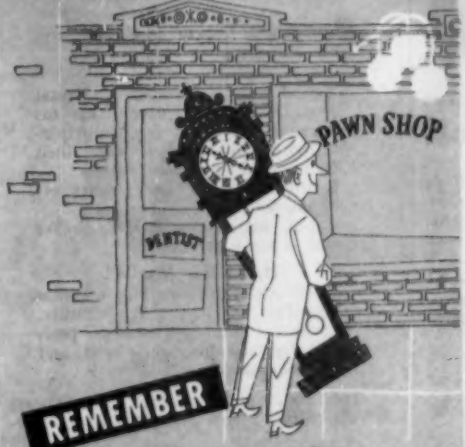

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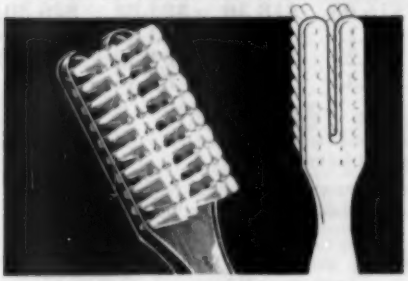

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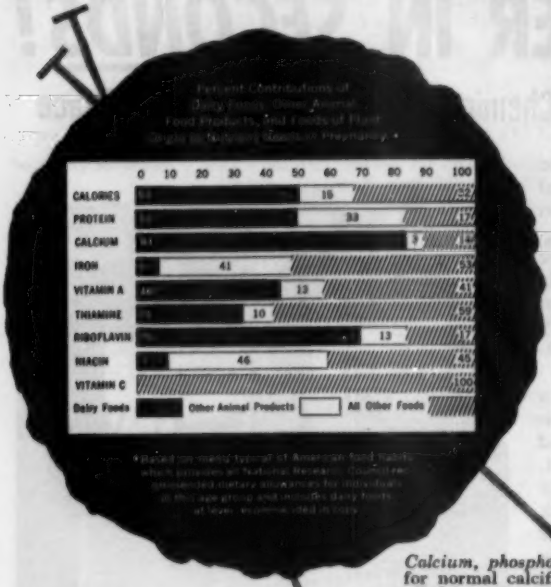

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The presence of this seal indicates that all nutrition statements in the advertisement have been found acceptable by the Council on Foods and Nutrition of the American Medical Association.

1. Toverud, K. V., Stearns, G., and Macy, I. G.: Maternal Nutrition and Child Health. Bulletin No. 123, National Research Council, Washington, D. C. (Nov.) 1950.
2. Keane, K. W., Cohn, E. M., and Johnson, B. C.: Reproductive failure of rats on glyceryl trilaurate-containing diets and its prevention by certain natural fats. J. Nutr. 45:275 (Oct.) 1951.

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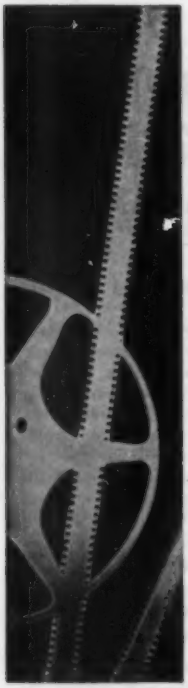

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Luxene 44 is not an acrylic resin. It is a vinyl co-polymer mixture plasticized with methyl methacrylate monomer and it possesses a combination of essential properties that have raised the standard of denture material values near the goal of perfection. It has been "built" by the world's foremost resin chemists specifically for dentures and it has no other commercial value.

However, it is one thing to produce a material which contains the essential properties of an ideal denture material but it is quite another thing to see that dentures made of this material are processed accurately and properly so that the valuable properties so painstakingly "built" into the product are not thrown away by careless or incompetent technicians.

To safeguard against this possibility, a precision technic has been developed which is known as the "Pressure Cast" process, and details of this process are covered in the following pages. Selected laboratories, which are competent and reliable, are equipped and trained to use the "Pressure Cast" process and they are capable of producing restorations in Luxene 44 to a standard of perfection, the highest anywhere known.

When Luxene-vinyl teeth are selected for use with Luxene 44 denture material, an even more serviceable and practical denture results because Luxene teeth do not crack or craze. The teeth are exceedingly tough and very rarely break, even if the denture is dropped on a tile floor. Luxene teeth also have superior wear resistance, extensive clinical tests over a period of several years has established this fact. The illustration used here is known as the All Luxene C-Tone denture. The C-Tone effect is created by laminating thin sheets of Luxene 44 with proper concentration of blue and red fibres. Oral pathologists say this effect simulates nature.

PUBLISHED ON BEHALF OF LUXENE SELECTED LABORATORIES

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LABORATORY ACCOMPLISHES

THE DOCTOR'S GOAL BY

THE USE OF THE FAMOUS

PRESSURE CAST PROCESS.

THIS CASTING PROCESS

VIRTUALLY ELIMINATES THE

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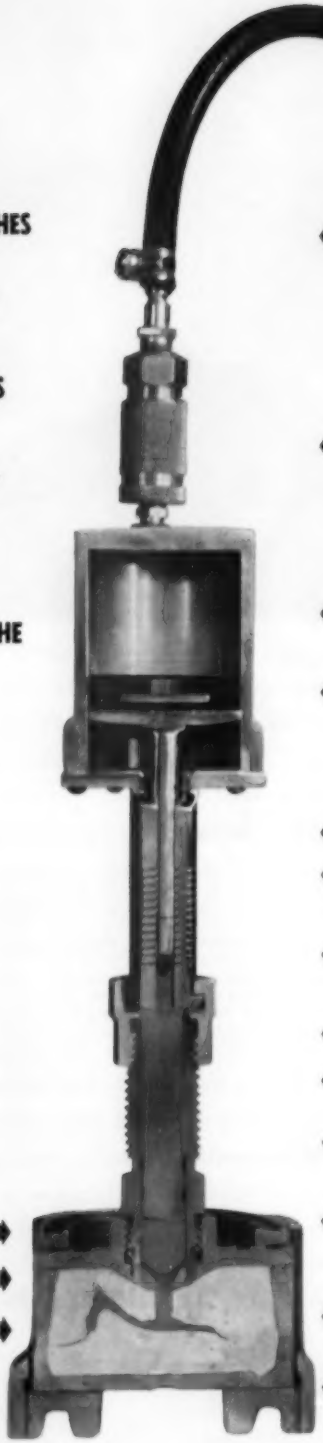

Hose to compressed air supply.

Air gun coupler permits an easy connection to air supply.

Air gun cylinder.

Air gun cup.

Air gun piston.

Air gun guide indicates amount injected.

Hole in piston enables operator to remove the piston by slipping metal rod through the hole and pulling it up. This is necessary for recharging.

Air gun adapter.

Piston.

Nozzle threaded to screw into air gun adapter.

Sprue button.

In the center of the flask is a cross-section of the moulded denture having no fin.

Bottom ring of the "cage" which, when tightened in cage closer, closes the flask perfectly.

Lid and bottom surface perfectly flat so as to close uniformly.

Side of cage.

Flask splits here. Notice how perfectly closed — metal to metal contact.

why risk these HAZARDOUS TEMPERATURES

created by frictional heat of rotating cutting instruments

The following chart is based on data from a study recently conducted by the School of Dentistry, University of Michigan, Ann Arbor, Mich.*

TYPE BUR	COOLANT	DEGREES F. RISE AT 1 LB. PRESSURE			
		2000 RPM	4000 RPM	6000 RPM	10000 RPM
#37 Steel	None	37°	60°	78°	112°
	Air Only	17°	25°	33°	43°
	Air-Water Spray	4°	7°	9°	12°
#37 Tungsten Carbide	None	26°	42°	57°	84°
	Air Only	17°	25°	33°	45°
	Air-Water Spray	3°	6°	9°	12°
#701 Diamond	None	21°	30°	39°	52°
	Air Only	9°	14°	18°	25°
	Air-Water Spray	2°	4°	7°	9°

* Report Published in New York Journal of Dentistry, 22:147-157 (April) 1952

NOTE: Degrees F. represent temperature rise above initial temperature of operating area. For example, at intermittent operation of 2 seconds cutting and 1 second rest, *without coolant*, a #37 steel bur at 1 lb. pressure and 6000 rpm increases the temperature 78° F. Accepting 90° F. as the initial temperature of the operating area, the cutting operation, therefore, brings the temperature in the tooth structure up to 168° F.

It can be readily seen that, even at minimum operating speeds and pressures, rotating cutting instruments create excessive heat, with needless risk of serious damage to tooth tissue and pain to the patient.

The Hanau Therm • Ex Spray, proved and acclaimed by thousands of users, effectively holds operative temperatures at a safe and tolerable level, *by providing at the tip of the bur an atomized water spray, or air only, as preferred.*

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prevent frictional heat with

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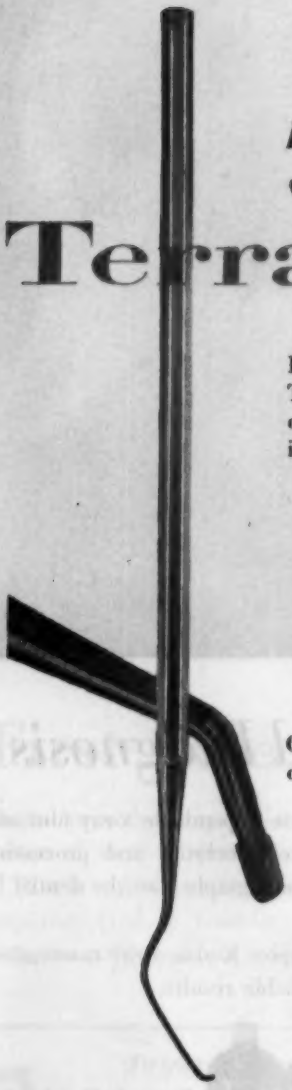

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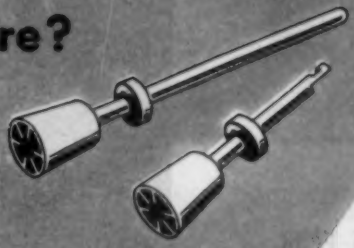

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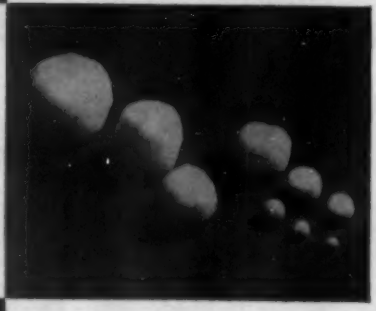

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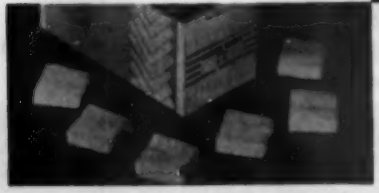

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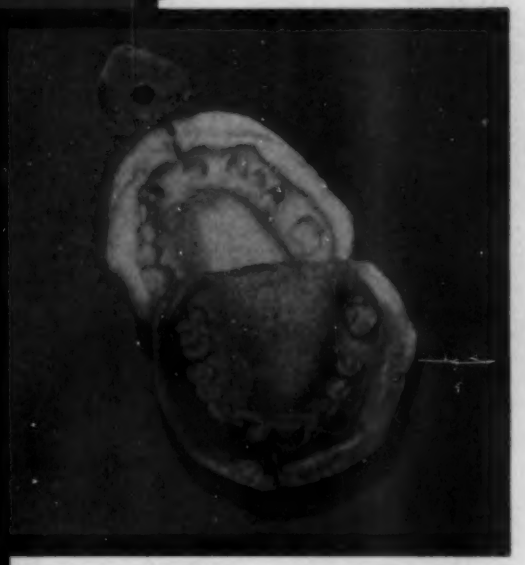

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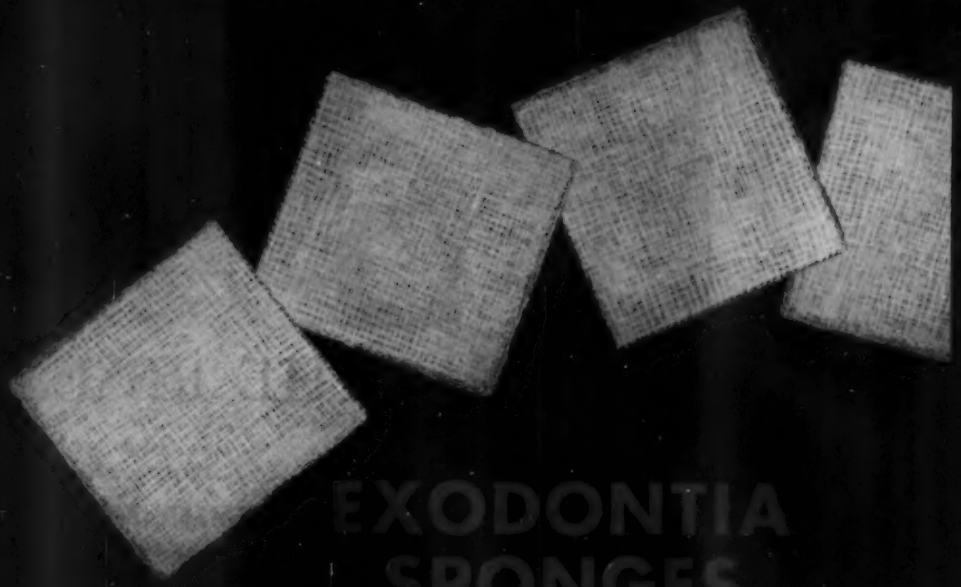

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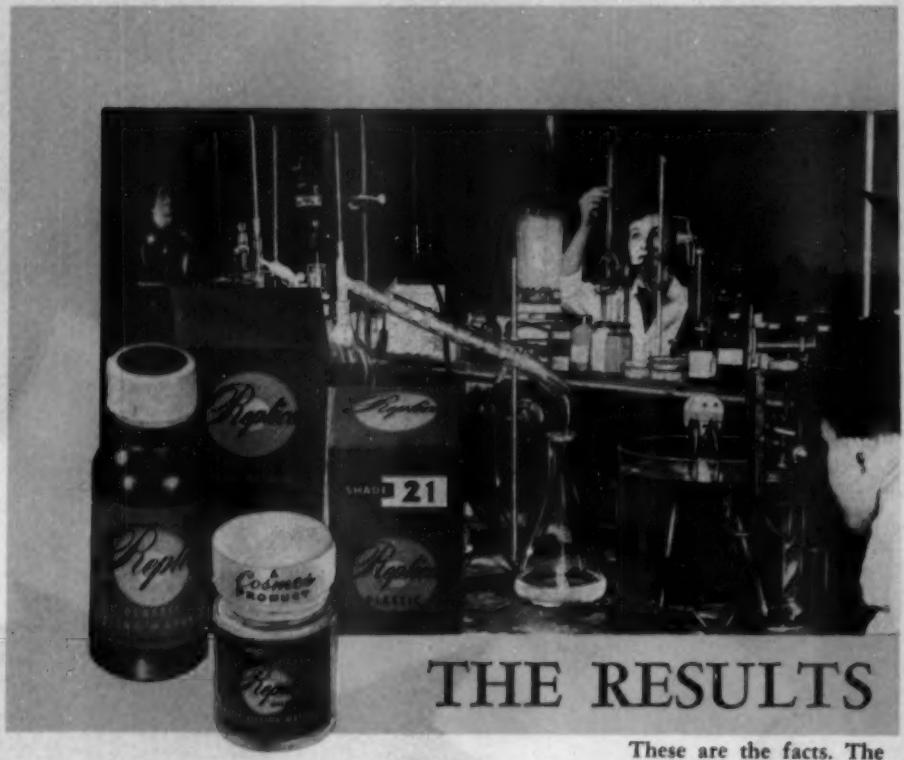

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With the introduction of Replica plastic filling material in 1949, developmental work did not cease in the Cosmos Research Laboratory. We have maintained a continuing program which has finally made it possible to offer the Profession a greatly improved product. We feel these improvements advance Replica plastic filling material to a new outstanding peak of performance in mouth service and ease of handling. The results outlined here are significant and of extreme importance to the Dental Profession. ★ ★ ★

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Improved powder formulation increases powder-to-liquid ratio for a workable mix consistency by 140%.

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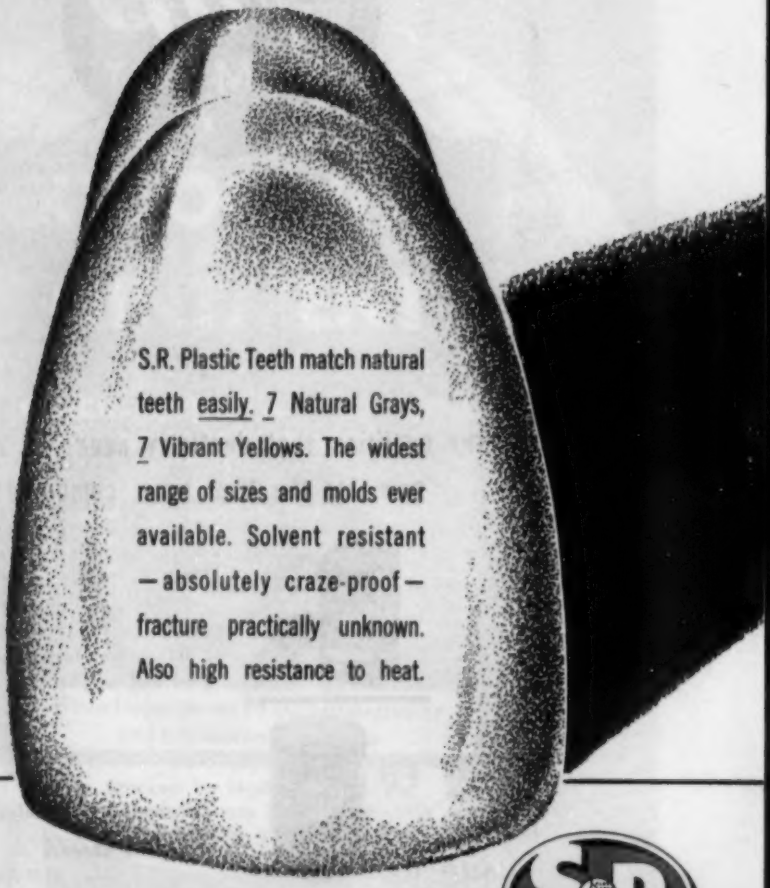
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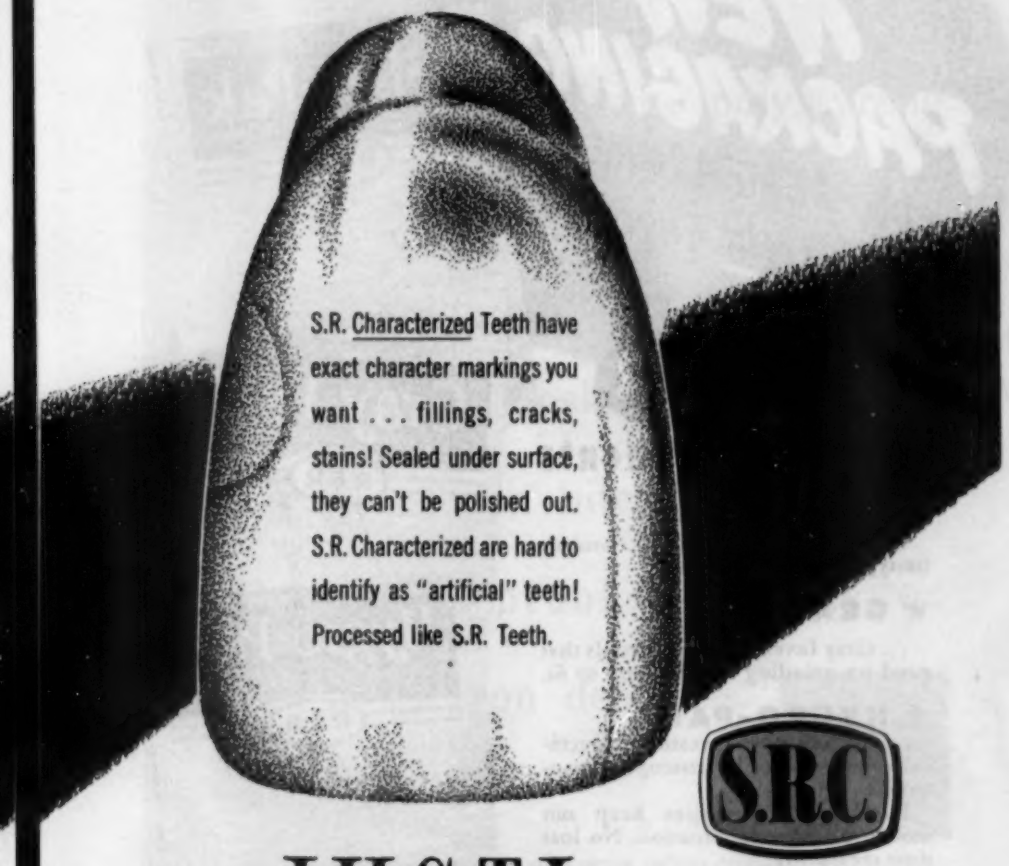
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Phospho-Soda (Fleet) is a solution containing in each 100 cc. sodium biphosphate 48 Gm. and sodium phosphate 18 Gm.

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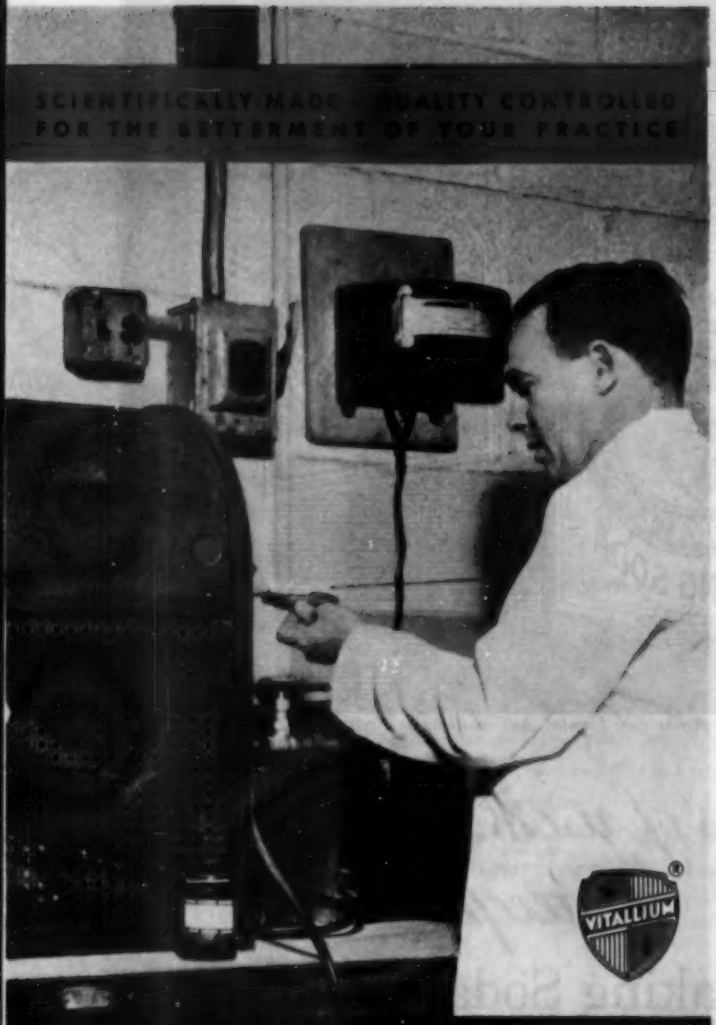

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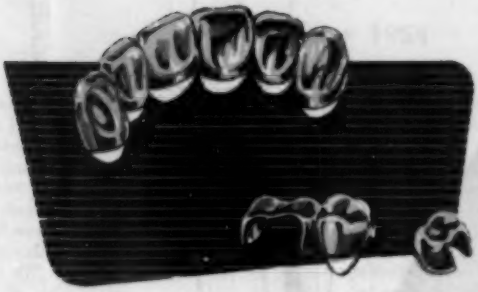

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